

The AMSAT[®] Journal

Editor-in-Chief:
Ed Long, WA4SWJ

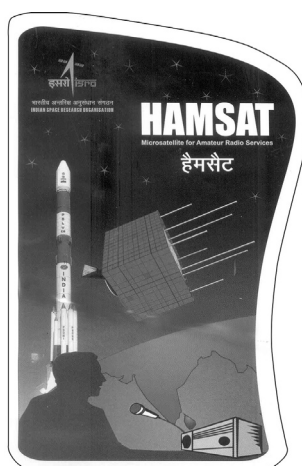
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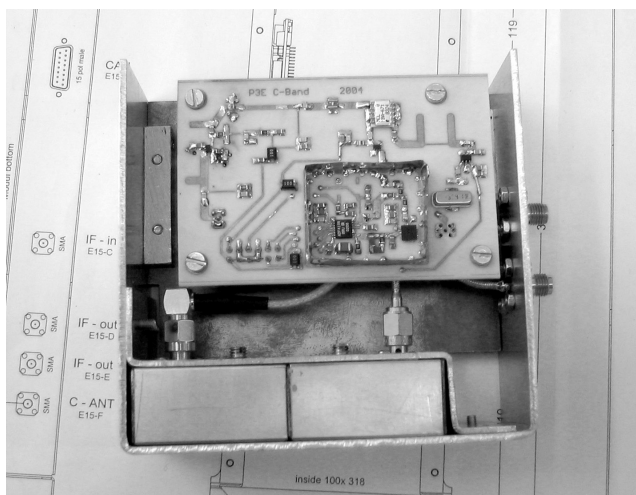


Dayton!



HamSat!

P3E!



AMSAT-NA
850 Sligo Avenue, Suite 600
Silver Spring, MD 20910-4730

Periodicals

POSTAGE PAID

At Silver Spring, MD
and at additional
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US taxpayers should be able to avoid capital gains taxes on appreciated securities and receive a deduction for their fair market value.

Bequest

A codicil in your will, naming The Radio Amateur Satellite Corporation as a beneficiary will help insure the continuance of the Amateur Radio Satellite program.

Call the AMSAT-NA office at 301-589-6062 for questions on any or all of these ways you can help build new and exciting satellites.

Support AMSAT-NA

IMPORTANT! BOD Nominations/Ballots

Nominations for the AMSAT Board of Directors closed on June 15th. The list of qualified candidates is as follows:

Barry Baines, WD4ASW
Emily Clark, W0EEC
Bob McGwier, N4HY
Richard M. Hambly, W2GPS
Lee McLamb, KU4OS
Gunther Meisse, W8GSM
Bruce Paige, KK5DO
Greg Wycoff, N0ZHE

Ballot cards will be mailed to members on or about July 15th and are due in the AMSAT office no later than September 15th.

Regards,
Steve Diggs, W4EPI
Corporate Secretary

AMSAT Space Symposium

2005 AMSAT Space Symposium and Annual Meeting -- Call for Papers --

This is the third call for papers for the 2005 AMSAT Space Symposium and Annual Meeting to be held October 7 - 9, 2005 in Lafayette, Louisiana. Proposals for papers and symposium presentations are invited on any topic of interest to the amateur satellite program.

We request a one-page abstract now. Camera-ready copy on paper or in electronic form will be due by August 1, 2005 for inclusion in the printed symposium proceedings. Abstracts and papers should be sent to n8fgv@amsat.org

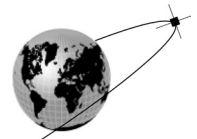
Dan Schultz, N8FGV

AMSAT's Mission

AMSAT is a non-profit volunteer organization which designs, builds and operates experimental satellites and promotes space education. We work in partnership with government, industry, educational institutions and fellow Amateur Radio societies. We encourage technical and scientific innovation, and promote the training and development of skilled satellite and ground system designers and operators.

AMSAT's Vision

Our Vision is to deploy high earth orbit satellite systems that offer daily coverage by 2009 and continuous coverage by 2012. AMSAT will continue active participation in human space missions and support a stream of LEO satellites developed in cooperation with the educational community and other



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The AMSAT Journal staff is always interested in article submissions. Whenever possible, submissions should be sent via e-mail to journal@amsat.org using plain text or word processor files; photos or figures in TIF, GIF or JPEG formats. AMSAT-NA reserves the right to select material for *The AMSAT Journal* based on suitability of content and space considerations. The editors of this publication are volunteers giving freely of their talents, time and efforts to produce *The AMSAT Journal*.

May has been a busy month for many of us starting with an unprecedented ex-parte meeting at the FCC, then SpaceDay at the Smithsonian Air and Space Museum's new Udvar-Hazy Center, a week-long trip to MIT's Haystack Observatory, the AMSAT-DC annual symposium and the Dayton Hamvention. The few days in between these events were devoted to earning a living and answering e-mails.

As I review my first seven months as AMSAT president I am pleased. We have continued AMSAT's tradition as the representative of our members and a leader in the worldwide amateur satellite community. We have begun a carefully planned evolution of AMSAT to meet the needs of the future through our Strategic and Tactical planning activities. We have reorganized the AMSAT executive branch around teams rather than the traditional hierarchy. Cooperation, communication and teamwork are the key precepts of this management style. We have rekindled our close working relationship with AMSAT-DC and the P3E project with both financial and personnel assistance. We have created a new AMSAT Web site and store. We have begun serious work on the Eagle high orbit satellite project. We have improved our financial reporting system and been certified by the Combined Federal Campaign (CFC). Our membership levels have begun to rise slightly after a long period of slow decline. There are many challenges ahead but we are on the right track.

Soon you will be asked to cast your ballots for members of the AMSAT Board of Directors. I would like to see a record turnout for this vote as a sign of your interest and support for AMSAT. Please take the time to review the candidates, their records and promises and then cast your ballots. This is the most important opportunity you have to influence the future of your AMSAT organization.

FCC

AMSAT has long been actively involved in FCC rulemaking activities, often without much public comment. A recent FCC action has threatened the very existence of the amateur satellite service as you know it so I am reporting to you on the most recent activities AMSAT has taken on your behalf. You can find all of AMSAT's filings on www.amsat.org under About AMSAT then Government Filings.

On June 21, 2004 the FCC released the *The AMSAT Journal* • May/June 2005 • www.amsat.org

Second Report and Order in the Matter of Mitigation of Orbital Debris, IB Docket No. 02-54. It amends Parts 5, 25, and 97 of the Commission's rules by adopting new rules concerning mitigation of orbital debris. On November 12, 2004 AMSAT filed a Petition for Reconsideration making a number of substantive arguments criticizing the serious impact of this Report and Order on the amateur satellite service. Early in 2005 the FCC asked for a meeting with AMSAT representatives to discuss the situation.

On May 4, 2005 AMSAT and the FCC met to discuss the FCC's Mitigation of Orbital Debris Report and Order and AMSAT's Petition for Reconsideration. In attendance for AMSAT were Richard M. Hambly, AMSAT President, Dr. Thomas A. Clark, AMSAT Board Member and Dr. Perry I. Klein, AMSAT VP of Government Affairs. We met with members of the FCC's Satellite Division, International Bureau, Stephen Duall, Karl Kensinger, John Martin and Sankar Persaud. Also in attendance was Jonathan Siverling of ARRL.

AMSAT presented a brief background and history of the organization and a summary of the several classes of satellites carrying amateur space stations according to size, ranging from the Cubesats measuring 10 centimeters on a side, to AMSAT-OSCAR 40 as the largest. We pointed out that complete information is on the AMSAT website, www.amsat.org.

AMSAT reiterated its assertion that it is not within the FCC's charter to formally regulate mitigation of orbital debris for amateur space stations. A full-size Cubesat model (on loan from Cal Poly) was shown to the group and we explained that most of these satellites are university-built satellites are far too small to include propulsion hardware to de-orbit them and that their extremely small area and mass themselves are a means of mitigating orbital debris and the risk of causing damage. By extension, AMSAT made the same argument for the next larger group of satellites, the Microsat class, that are typically approximately 25 cm cubes weighing 10 kg. We also noted that we are "hitchhikers" on the launch vehicle and are not able to dictate the launch parameters – especially altitude.

The Commission representation noted that



their principal concern is with LEO satellites with orbits between 600 km and 2000 km. Below that critical altitude, orbits are self-cleaning over timescales < 25 years.

AMSAT and the FCC agreed to continue working together to try to achieve an appropriate accommodation for satellites in the amateur satellite service, regardless of the planned orbit. However, AMSAT maintains that the arguments in our Petition for Reconsideration are valid and need to be fully considered by the FCC.

73,
Richard M. Hambly, W2GPS
President



CFC Certification

AMSAT Receives CFC Certification

by Gunther Meisse, W8GSM,
w8gsm@amsat.org

Attention Federal Employees! !

You may now donate through payroll deduction to the efforts of AMSAT.

Effective this year, AMSAT has successfully applied for, and been granted, certification by the Federal Office of Personnel Management to participate in the 2005 **Combined Federal Campaign** which takes place this fall. There are rigorous standards used to evaluate the worthiness of all applicants. It is a first for AMSAT and we are proud to have been recognized for our educational contributions in the area of space technologies.

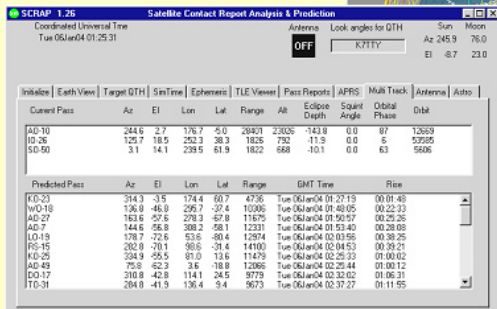
Payroll deduction is a painless way to show your support for the works of AMSAT around the world. We hope you will take this opportunity to support your organization as we march forward into a new era of educational outreach and the deployment of 24/7 high earth orbit satellites. The challenge is great and only through the generosity of our supporters can we meet our objectives. We will keep you posted with our agency number as soon as it is issued.

We urge you to spread the word about the projects of AMSAT to your fellow workers with the hope of encouraging them to list AMSAT as one of their charitable recipients in 2005. If you need any literature or other information about AMSAT, please ask. Be an Ambassador for AMSAT.

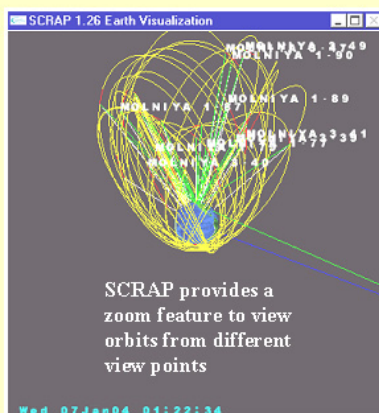


Satellite Contact Report Analysis Prediction

AMSAT is now the North American distributor of SCRAP, a tracking program designed for ham satellite applications for Windows 95+

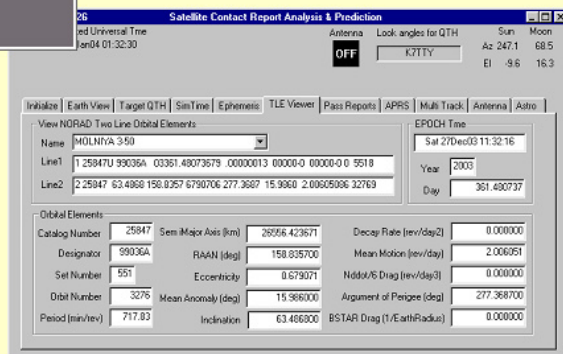


SCRAP provides a real-time contact report and display for over 2000 satellites on a Microsoft Windows 95+ Pentium platform.



Eleven panels provide for controlling functionality

1. Initialization
2. Earth View
3. Target QTH
4. Simulation
5. Ephemeris
6. TLE Viewer
7. Pass Reports
8. APRS display
9. Multi-Track display
10. Antenna rotor control
11. Astronomical prediction



SCRAP

is a product of the

Bytheway Software Development Lab (BSDL)

Price is \$50 for AMSAT members, \$60 for non-members, postpaid on CD-ROM. Order by calling 1-888-322-6728, or use the online shop at

<http://www.amsat.org>

The author, Bill Bytheway, K7TTY donated SCRAP to AMSAT. All proceeds support AMSAT.

Free software upgrades and further information can be found at

<http://www.rtty.com/bytheway>



Reprinted from *The Satellite Beacon*
A monthly publication of the
Project OSCAR Amateur Radio Club
This Month's Topic – APRS® Satellites for Everyone

by Eric H Christensen, KF4OTN, Project OSCAR member



Satellite communication has become open to most, if not all, Amateur Radio operators around the world using simple equipment that some already have in their personal inventories. Low Earth Orbit (or LEO) satellites are being built with increasing numbers that are carrying FM repeaters and FM digital equipment that operate in the common 2m uplink and 70cm downlink or Mode-J. Because these satellites are in lower orbits, amateurs with handheld and mobile radios can use these satellites as repeaters in the sky.

One new technology being implemented is the Automatic Position Reporting System or APRS®. This allows the amateur to send a short burst of data that includes the station's call sign, position, type of station, and some text up to the satellite. There it will be received and digipeated (digitally repeated) back to Earth for many other satellite operators to receive. APRS makes it possible to have many "conversations" going on over the satellite, simultaneously, without disrupting the rest of the operators.

With the equipment that is available today, there really isn't any excuse why more amateurs aren't out there enjoying these resources. Newer radios including handhelds that will interface to both mobile and handheld GPS units, and will automatically

update their position. Digital messages have been sent to and from stations using this simple setup allowing amateurs who are hiking, camping, or have antenna restrictions to join in and exchange messages with other hams hundreds or thousands of miles away. One ham even used APRS to beat a speeding ticket by showing the judge she couldn't have been speeding because APRS recorded her speed over that stretch of road as many miles per hour less.

Currently there are two satellites active that support APRS; NO-44 (PCSAT) and the ISS, both of which can easily be used with mobile and handheld radios. At the time of this being written, both satellites are orbiting the earth listening to 145.825 MHz and waiting to hear an APRS formatted packet. Using a handheld such as a Kenwood D7A(G) dual-band handheld radio will allow amateurs to transmit position information packets up to the satellite or ISS and monitor messages from other users. The stock antenna will work, higher-gain antennas will add to your fun! Antennas like the Arrow (or similar) and the Pryme AL-800 make excellent satellite antennas for not only APRS but for voice communications too. Unlike other satellites both NO-44 and the ISS work on 2M only, so a dual band radio is not required for APRS. NO-44 orbits at approximately 750km about

the earth. With a digipeater up that high you can expect your packets to be heard for thousands of kilometers. Usually you can operate on this satellite for about ten minutes per orbit. Bulletins are transmitted on the terrestrial APRS frequency (144.390 MHz) when the satellite is overhead and in good working order. See the AMSAT Web site for more information.

The International Space Station is also available for APRS. Orbiting at approximately 350 km above the Earth, the ISS doesn't have as big of a footprint as NO-44. The ISS digipeater is shared with the ISS BBS so it is a little more difficult to use as there are more users on the uplink.

APRS is a fun mode to use but why not take it to the next level and utilize equipment for a completely different experience. If a one-hop QSO that would land your packet over 3000km away doesn't sound like fun, then I don't know what does!

For additional information on amateur satellites, check out the following Web sites:

Project OSCAR – <http://www.projectoscar.net>
AMSAT – <http://www.amsat.org>
ISS APRS Log – <http://www.findu.com/cgi-bin/ariss/index.cgi>
PC Sat APRS Log – <http://www.findu.com/cgi-bin/pcsat.cgi>
WB4APR's Web site:
<http://web.usna.navy.mil/~bruninga/>

Dayton Preview - see article



Gould Smith, WA4SXM, puts some last minute finishing touches on the satellite tracking display at the AMSAT booth.



Emily Clarke, W0EEC, and Martha Saragovitz, AMSAT Manager, enjoy a few relaxing moments at the AMSAT banquet after a hard day working the AMSAT booth.



AMSAT's Dr. Tom Clark, W3IWI, Awarded IAA Medal

The Institute of Applied Astronomy (IAA) of the Russian Academy of Sciences awarded a Gold Medal to Dr. Thomas A. Clark, W3IWI, of Clarksville, MD for his lifetime contributions to development of Very Long Baseline Interferometry (VLBI). IAA's director, Professor Andrey Finkelstein, presented the medal during a ceremony held on February 10th at the IAA in St. Petersburg. This was the first time the medal was presented to a non-Russian scientist.

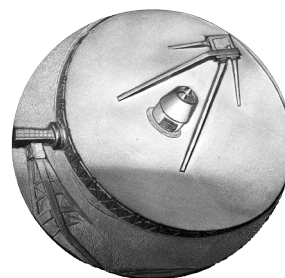
Tom Clark began the VLBI program at NASA Goddard Spaceflight Center in 1968. VLBI is an astronomical technique that observes Quasars with multiple radio telescopes separated by thousands of kilometers. Signals are time-tagged with highly stable clocks and recorded. The recordings from all stations are sent to a central facility where the signals are compared. VLBI was originally developed by astronomers to study Quasars, the most distant visible objects in the universe. Clark and his colleagues at MIT, the Haystack Observatory and NASA applied VLBI to geophysics by measuring the distances between the radio telescopes with accuracies better than one centimeter. With these measurements they were able to measure tectonic motions (sometimes called continental drift) between North America, Europe, Africa, the Pacific Basin, Asia and Australia. In California these motions amount to about 2½ inches per year along the San Andreas Fault, while North America and Europe are separating by about ¾ inch per year. Before VLBI, these motions had only been observed by geological techniques over time scales of thousands to millions of years. VLBI was able to map the motions with higher accuracy over time scales of a few years.

Tom and his wife Elizabeth traveled to St. Petersburg as the guests of the IAA.

Activities included a trip to the IAA's 32 meter radio telescope at Svetloe, about 50 miles northwest of St. Petersburg. During their one-week visit, they also visited many historical sites including the Hermitage, Katrina Palace, the Amber Room, several churches and the opera *Samson and Delilah* at the Marinsky Theater.

Alex Zaizev, RW3DZ, an ionospheric physicist from Moscow, traveled to St. Petersburg to support IAA in honoring Tom. Alex is well known in the amateur satellite world for sponsoring the development of the educational satellite Kolibri. Alex toured the 32m IAA telescope at Svetloe for the first time and enjoyed climbing to the telescope's feed with Tom. After receiving the IAA medal, Tom presented a lecture entitled "*Building the Geodetic VLBI Network - Some Personal Recollections*" with Alex acting as translator. At the conclusion of Tom's lecture, Alex offered a few comments on the amateur satellite program, including descriptions of AO-51 and Kolibri. Kolibri (meaning "hummingbird") carried the designation RS-21.

Tom is a 28-year resident of Clarksville and directed NASA's VLBI program until his retirement from Goddard in 2001. Since that time, he has been the Chief Scientist at Syntronics LLC in Columbia. Dr. Clark has been on the AMSAT BoD since the 1970's and served as president in 1980-84. His hobbies include Amateur Radio, photography, travel and his supercharged Mini Cooper.



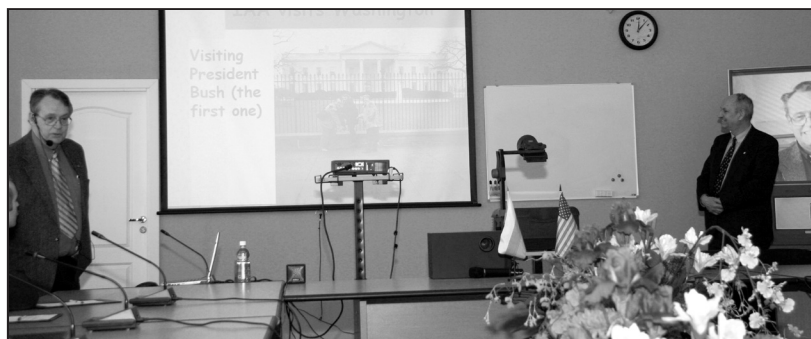
The medal (left) awarded to Dr. Clark represents the IAA's 32m telescope design. Three of these telescopes exist: Svetloe, about 60 km northwest of St Petersburg, halfway to the Finnish border, plus twin telescopes at Zelenchuskaya in the North Caucasus (not far from Chechna) and one in Siberia near Lake Baikal.



Dr. Clark being awarded the IAA Medal by Professor Andrey Finkelstein.



The Svetloe telescope.



Here Dr. Clark (left) is giving the Medal Lecture. Alex Zaitzev, RW3DZ, is translating the lecture into Russian.



Dr. Clark (left) and Alex Zaitzev at the Svetloe telescope.

OSCAR-11 21st BIRTHDAY REPORT

Clive Wallis, G3CWV,
g3cww@amsat.org

10 March 2005

OSCAR-11 achieved 21 years in orbit on 01 March 2005. It's still working and sending reliable telemetry on its VHF beacon. Congratulations to Professor Sir Martin Sweeting, G3YJO, and his team for this fine achievement.

During the period 15 February to 09 March 2005 reliable signals have been received from the 145.826 MHz beacon, transmitting continuous ASCII telemetry from 25 February to 06 March. At times signals have been weaker than usual, and subject to local interference (QRN), which has been stronger than usual.

The beacon operates under control of the watchdog timer. Observations have indicated that the cycle is approximately 10.3 days ON followed by 10.4 days OFF. Assuming that this cycle continues, the beacon should switch ON around 17 March.

The internal temperatures have decreased by about five degrees C. They are now 14C, 13C and 20C for the battery, telemetry electronics and command decoder respectively. At the present time the satellite is in full sunlight, and therefore temperature changes are caused by changes in attitude, and spin rate. The hot external surfaces will cause some nearby internal parts to warm up faster than others. Solar eclipse predictions indicate that the continuous sunlight will continue until the end of April, when eclipses will start.

The battery voltage has varied between 11.7 and 13.7 volts. The average voltage was 12.4 volts, unchanged since the last report. Low battery voltages have occurred when the internal temperatures were depressed.

The period of rotation about the Z axis had been determined from the solar array currents. Values of between 431 and 590 seconds have been observed.

Users of OSCAR-11 should note that the date in the telemetry is now advanced by FOUR days. The time is advanced by 20.6 minutes, and this error is increasing by about one minute per year.

OSCAR-11 now operates in a default mode, controlled by the watch-dog timer. The satellite transmits continuous ASCII telemetry for approximately 10.3 days on 145.826 MHz, followed by 10.4 days of silence. This regular sequence might be
... continued on page 9

AMSAT Eagle Update

James A. Sanford, PE, WB4GCS

Eagle Project Manager

Our Vision is to deploy high earth orbit satellite systems that offer daily coverage by 2009 and continuous coverage by 2012...

I write this shortly after a great weekend in Dayton. I spent as much time as possible in the AMSAT booth and thoroughly enjoyed meeting and speaking with many of you. During setup, I had an interesting conversation with a gentleman, which I'd like to share. He's an HEO aficionado and didn't want to hear about what we're doing with Eagle in some years. He wanted to hear what's available *NOW* or *SOON*. This is a very reasonable question. The answer is in the vision statement above – Eagle is Bird 2 to achieve that vision. Bird 1 is P3E, being built by AMSAT-DL with major participation by many of your Eagle team members. Remember, we will be flying many pieces of common hardware. There's a *lot* of good information about P3E on the AMSAT-DL web site, which you can reach from the link on www.amsat.org.

After the Forum on Saturday morning, I met, or was referred to, several new volunteers for the Eagle team. Thank you all. By the time you read this, we should have already been in contact. If you left a card or note and haven't heard from me, please contact me directly.

Speaking of new folks, Martha advises that we signed up over 200 new members or renewals at Dayton. Thank you all. I sensed that we had more traffic at the AMSAT booth than last year, and I think I saw higher traffic inside Hara and at the flea market. Regardless of the numbers, I sure enjoyed it, and hope you did too.

Here's the latest on Eagle. Coding and testing of the Software Defined Radio (SDR) package continues. Bob tells me that he will *demonstrate a prototype UV package at Symposium in October!* This will not be flight ready hardware, or even resemble it, but it will be a working prototype. Make your reservations now.



We have in hand enough CAN-DO! modules to meet Eagle's anticipated needs. This technology will eliminate a huge wiring harness that caused the AO-40 integrators and testers a lot of work. Eagle will fly proven technology, courtesy of P3E.

We have an IHU-3 in hand, ready for software testing followed by radiation testing. This will also be proven in P3E before we fly it in Eagle.

Finally, NASA is considering another GPS experiment. Flying a GPS package in AO-40 served AMSAT well, and if our parameters meet their needs, we may get to do it again. This is good news!

One last thought. Martha tells me we've raised just over \$2000.00 for Eagle so far this year. If we hadn't had some significant equipment loans and donations from AMSAT members and Eagle team members, some of the work above would not be happening. Eagle is operating within a budget and is close to the line. If you have not yet contributed, please consider the maximum contribution you can afford. Beyond that, please talk up AMSAT and Eagle at your local club meetings and other gatherings. We are ALL recruiters for AMSAT. Thanks!

As always, comments and questions to: wb4gcs@amsat.org



Suitsat Nearing Launch

June 10, 2005

Suitsat Hardware Delivery

All,

I am proud to announce that today the ARISS-US team has delivered their portion of the Suitsat hardware to the NASA Johnson Space Center. NASA is in the process of shipping this hardware to Energia in Russia where it is expected to be certified and integrated with the Russian team's Suitsat equipment for eventual launch on the 19P Progress launch vehicle in the August/September 2005 timeframe.

The Suitsat Amateur Radio system, coupled with a school artwork DVD project that will be delivered later this month, is planned to be installed in an outdated Russian Orlon spacesuit in late September. It will then be deployed from the ISS during an Extra Vehicular Activity (EVA, or spacewalk). The Suitsat Amateur Radio system will beam down special messages and an SSTV image from within the Orlon space suit as it floats in space. The Suitsat radio system will allow hams and students to track the suit and decode special international messages, space suit telemetry and a pre-programmed Slow Scan TV image through its specially-built digital voice messaging system and Amateur Radio transmitter. As built, Suitsat will have a transmit-only capability and will run on the space suit's battery power.

The idea for Suitsat was first conceived by the ARISS-Russia team, led by Sergey Samburov, RV3DR, and was extensively discussed at the joint AMSAT Symposium/ARISS International Partner meeting in October 2004. The project, also called Radioskaf or Radio Sputnik in Russia, is being led by project manager A. P. Alexandrov and Deputy Project Manager A. Poleshuk from RSC Energia, located in Korolev (Moscow area) Russia. On the US side, the hardware project development was led by Lou McFadin, W5DID.

Since October the Suitsat design concept matured and evolved due to the challenging development time constraints. A joint NASA letter, allowing the ARISS team to proceed forward with the Suitsat project was signed on May 10, 2005. In the four short weeks since that letter was signed, the US project team, has designed, built and tested a simple, yet fully featured system that we hope will inspire hams and students around the world.

On behalf of the ARISS International team,

I want to congratulate the Suitsat hardware development team for their "Can Do" spirit and ability to deliver the Suitsat hardware on such a very challenging schedule.

Congratulations!!!!

Frank H. Bauer, KA3HDO

ARISS International Chairman

AMSAT V. for Human Spaceflight



Please support AMSAT-NA.
Thanks!



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interrupted by ground control, at any time.

At the present time the mode-S beacon 2401.5 MHz. and the UHF beacon 453.025 MHz are both OFF.

Listeners to OSCAR-11 may be interested in visiting my Web site. The Web site contains details about using a soundcard for data capture and details about using hardware demodulators. There is software for capturing data, and decoding ASCII telemetry. There is an archive of raw data for analysis, which is continually being expanded, as new data is captured. Originally this was for WOD, but it is now being expanded to include ASCII telemetry. At the present time the telemetry covers 1996 to December 2004. I will add other years as time permits. In parallel there is a news archive which provides an overview of the state of the satellite, at the times when the telemetry was captured.

If anyone out there can provide any data, particularly for the 1984 to 1993 years, this would be most appreciated. Please e-mail me with details. However please DO NOT SEND ANY FILES, before further discussion.

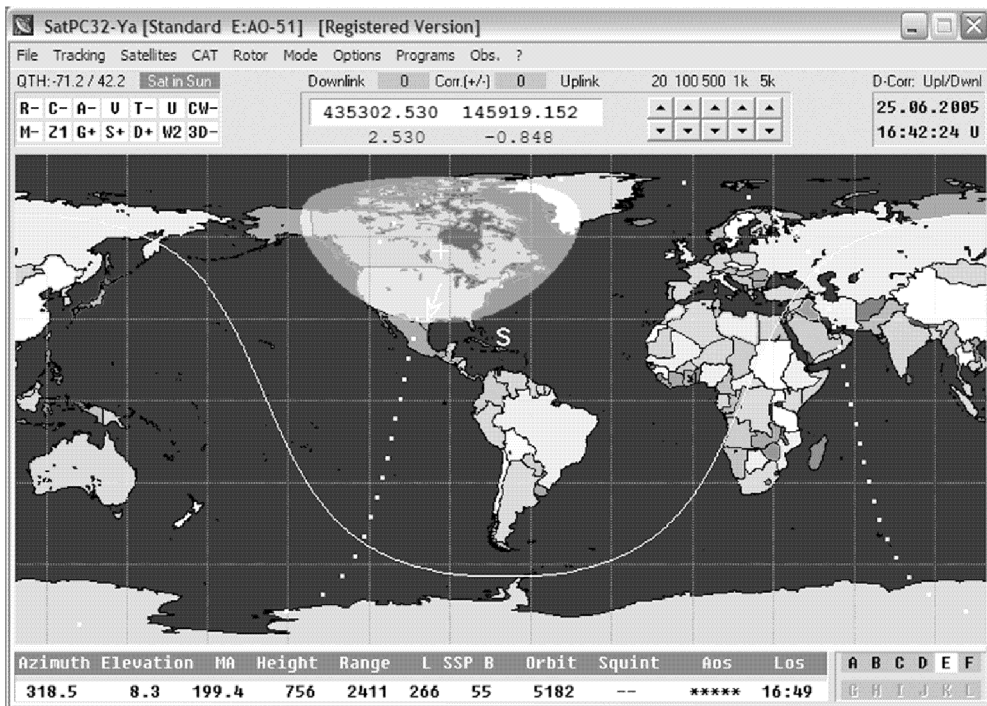
Also included are some audio files, examples of each type of data transmitted by OSCAR-11, each one plays for about ten seconds. There are also examples of mode-S reception. All the audio files are zipped, so that they can be played off-line. These should help listeners identify the various types of data, and give an indication of the signal quality required for successful decoding.

The URL is - <http://www.users.zetnet.co.uk/clivew/>

If you place this bulletin on a terrestrial packet network, please use the bulletin identifier \$BID:U2RPT107.CWV, to prevent duplication.



AMSAT is the North American distributor of SatPC32, a tracking program designed for ham satellite applications. For Windows 95, 98, NT, ME, 2000, XP.



Above: Screen shot of AO-51 passing over North America

Version 12.3

Features:

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- Doppler tuning with on-screen frequency displays. Radio models supported: Yaesu FT-847, FT-736R, FT-817, FT-857, FT-897 ICOM IC-820H, IC-821H, IC-910H and other ICOM radios Kenwood TS-790 and TS-2000 DDE client programs
- "Transparent" VFO-knob tuning in addition to keyboard and mouse tuning.
- "Virtual" VFO tracking for half-duplex transceivers FT-817, FT-857, FT-897.
- Includes a special version for ISS split-frequency operation.
- Controls subaudible tone on FT-847, FT-736R, FT-817/857/897, and IC-910H.
- Includes a non-graphical version and programs that output lists to the screen, printer, or a file.
- Interfaces with WiSP, with user-defined satellite switching priority.

Price is \$45 for AMSAT members, \$50 for non-members, postpaid on CD-ROM.
A demo version may be downloaded from <http://www.dk1tb.de/indexeng.htm>
A registration password for the demo version is \$40 (members), \$45 (non-members).
Order by calling 1-888-322-6728, or use the online shop at www.amsat.org.
The author DK1TB donated SatPC32 to AMSAT. All proceeds support AMSAT.



AMSAT Highlights at the 2005 Dayton Hamvention

Barry A. Baines, WD4ASW, wd4asw@amsat.org

VP-Marketing & User Services

AMSAT enjoyed another outstanding weekend at the Dayton Hamvention. Thanks to the efforts of our cadre of dedicated volunteers who manned the AMSAT booth, made Forum presentations and assisted with setup and takedown of our exhibit, AMSAT had a very strong presence at this year's Hamvention, which took place May 20-22. Highlights include:

Extensive satellite demonstrations over three days included FO-29, SO-50, AO-51 (V/S mode), and VO-52. Several hundred people witnessed successful contacts and a number of individuals were given the opportunity to work the satellites. Drew Glasbrenner, KO4MA, and his team did a masterful job of running these demonstrations.

Once again an AMSAT membership drive was offered for new and renewing memberships at Hamvention. Jim Brooker, WZ8K, of Royal Oak, MI won the SSB Electronics UEK-3000 S-Band downconverter with the winner's choice of 2 m or 70 cm IF.

The AMSAT Forum on Saturday morning was packed with several hundred attendees.

The major areas covered by four presentations were AMSAT's Vision and Mission, Project Eagle, AMSAT-UK's SSETI Transponder, and an update on ARISS.

AMSAT's library of publications was very popular. Gould Smith, WA4SXM, released updates to several books, including "Getting Started with Amateur Satellites" and "Digital Satellite & Telemetry Guide." The latter replaces the "Digital Satellite Guide" and includes expanded information on WiSP and incorporates all current satellite telemetry as well. The recently revised (January 2005) "AO-51: Operation, Development and Specifications", which is written from the operator's perspective for using AMSAT's latest satellite, was also available. Mike Seguin, N1JEZ, provided an updated "Amateur Satellite Frequency Guide" that includes HAMSAT and SSETI frequencies.

AMSAT demonstrated and offered the latest version of MacDoppler PRO from Dog Park Software that has been designed for MAC OS X and is available at a discount

to AMSAT members. Tracking programs, SatPC32, Nova for Windows, SCRAP and InstantTrack were demonstrated on two laptops. As in past years, the Arrow Antenna was available at the AMSAT booth.

A CubeSat from California Polytechnic Institute was placed on display. The prototype was provided by Cliff Buttschardt, K7RR, who serves as an AMSAT mentor to the student project. This equipment was previously displayed at 'Space Day' at the National Air and Space Museum prior to Dayton.

The AMSAT Friday evening dinner at the Amber Rose Restaurant was well attended. For the first time in several years there was an after dinner speaker, former astronaut Dr. Tony England, W0ORE.

According to the ARRL, Hamvention attendance was up slightly from 2004, with 20,411 being the 'official' attendance (+542 vs. 2004). For the first time in several years the weather cooperated with good weather all three days. Saturday was overcast and cool, which created good conditions for checking out the flea market. Sunday morning was very sunny, which caused some people to complain that it was too warm. Despite some empty exhibitor and flea market spaces, Dayton continues to be the premier Amateur Radio show in North America and the Hamvention Committee confirmed that the 2006 and 2007 Hamvention will be at the Hara Arena. Next year's dates are May 19-21, 2006.

AMSAT benefits from a cadre of individuals, who handle the preparations for Hamvention, deal with booth setup and work the variety of logistical issues that are part of Hamvention. Arrangements began with obtaining a block of hotel rooms at the Hampton Inn in Fairborn under AMSAT's control that was coordinated by Martha Saragovitz. Dayton Team Leader, Barry Baines, WD4ASW, coordinated booth arrangements with the Hamvention Commercial Exhibit Committee and the Forum Committee on time and location for the AMSAT Forum.

Efforts then began in earnest to provide updated materials at Dayton and to coordinate the myriad of AMSAT activities at Dayton. Ed Collins, N8NUY, worked with the Amber Rose Restaurant to finalize arrangements for



The Satellite Demo Team at work. Drew Glasbrenner, KO4MA, holds an S-Band antenna and downconverter for AO-51 as Mark Hammond, N8MH, holds the Arrow Antenna for the 70CM uplink. Jeff Griffin, KB2M, (in dark shirt to the left of Drew) assists with the radios. In the foreground, Dan Schultz, N8FGV, (left) and John Shew, N4QQ, (right) look on. During the course of the weekend, several hundred onlookers witnessed satellite passes during nine demonstrations. (Photo by WA4SXM)





Dr. Tony England, W0ORE, (center, behind table, wearing an AMSAT hat) spent an hour at the AMSAT booth on Friday morning talking to attendees. That evening, Tony was the after dinner speaker at the AMSAT banquet. On the right is AMSAT VP-Human Spaceflight Frank Bauer, KA3HDO, who spoke at Saturday's AMSAT Forum on ARISS. Tony was the second US astronaut to operate Amateur Radio from space. (Photo by WA4SXM)

the Friday evening dinner and publicized the dinner on amsat-bb. Author Gould Smith, WA4SXM, along with Mike Seguin, N1JEZ, were contacted to ask about updating their publications in time for Dayton. Two new golf shirts were designed and available, one sporting an Eagle theme developed by Emily Clarke, W0EEC. A traditional AMSAT T-shirt was also designed.

AMSAT is indeed fortunate that Ed Collins, N8NUY, lives in the Dayton area, as he provides an invaluable service by serving as a liaison with the Hamvention Committee that resulted, for example, in having our AMSAT Friday night dinner information and Thursday night 'Pizza n' Suds' social function included in the Hamvention Program Guide. He served as our local address for receiving AMSAT materials and placing them in a storage locker rented by AMSAT along with all of the other AMSAT booth materials. Ed also arranged for a cargo van rental to transport our booth equipment along with the books, trinkets, etc. that we offer every year from our storage locker to Hara Arena.

The first wave of volunteers met for breakfast at the Hampton Inn on Thursday, May 19. Robin Haighton, VE3FRH, Gould Smith, WA4SXM, and Barry Baines, WD4ASW, went to obtain the van and returned to the hotel. They were joined by a group of volunteers that consisted of Rick Hambly, W2GPS, Tom Clark, W3IWI, and Chuck

Pinkham, K3PER, who proceeded to the storage locker to collect the booth equipment, boxes of items shipped to Dayton and support materials and place it all in the van. The group then proceeded to Hara Arena.

Setup at our usual booth location (445-448) went smoothly on Thursday as additional volunteers (such as Ed Krome, K9EK, and Drew Glasbrenner, KO4MA) arrived to assist with the process. Bob Carpenter, K3OTC, arrived with a carload of materials from the AMSAT office in Silver Spring. Ed Krome, K9EK, served as 'Mr. Fixit' as he did some repair work on the cash drawers and booth fixtures. First built in the early 1990's by Mike Crisler, N4IFD, our booth hardware was starting to show its age and required some updating.

The booth configuration this year was slightly different than past years. The key modification was inclusion of a projection area at one end that allowed Emily Clarke, W0EEC, to give a brief beginner's presentation prior to each scheduled satellite demonstration. Once the presentation was given, visitors were invited to go outside the Ballarena Hall entrance to watch the demo given by KO4MA and the team. We also had two new banners on display designed by Emily, W0EEC. One featured a fund raising theme for Eagle ("Help Hatch Eagle") and the other highlighted AMSAT in general ("We ARE Rocket Scientists-AMSAT").

Thursday evening was the 'lull before the storm' as Hamvention began the next day. Over 70 people attended the 'Pizza and Suds' informal get together in Beavercreek, OH that provided an opportunity to see old friends and meet new acquaintances.

The opening of Hamvention on Friday at 0900 began a three-day marathon of booth activities that required over 100 volunteer hours just to man the booth. Over 30 volunteers spent a portion of their weekend at the booth assisting people who wished to join or renew their memberships, obtain the latest software or publications, pickup the latest in AMSAT 'fashions' (hats, golf shirts, and T-shirts) or donate to the Eagle Fund. Meanwhile, Martha Saragovitz and Bob Carpenter, W3OTC, coordinated the myriad of charge card activities, handled membership questions and helped to ensure the smooth operation of the booth.

AMSAT President Rick Hambly, W2GPS, scheduled 'office hours' at the AMSAT booth so that members would have an opportunity to discuss what was on their minds about our organization. Rick's availability was designed to make the president more accessible to the membership. This is a 'tradition' begun by former President Robin Haighton, VE3FRH, and continued by Rick.

One of the joys of Hamvention is the opportunity to see old friends and to meet new ones. The annual AMSAT Friday night



Eagle Project Manager Jim Sanford, WB4GCS, gives an update on Eagle at the Saturday morning AMSAT Forum. At Hamvention, AMSAT introduced the "Help Hatch Eagle" fundraising theme. At the Forum, the audience placed over \$230 in donations for Eagle as AMSAT "passed the hat". (Photo by W3IWI)



dinner took place once again at the Amber Rose Restaurant in Old North Dayton. Nancy Makley, KC8GYW, handled advance reservations and maintained the 'head count' for the restaurant and coordinated the affair. Nancy was available at the AMSAT booth on Friday to take additional reservations and provide directions on how to get to the Amber Rose. Over 85 people attended the dinner. As usual, the Amber Rose did a fine job of providing a well-prepared meal that was moderately priced.

AMSAT members and their guests enjoyed listening to an after dinner speaker who is well known for his significant accomplishments. Dr. Tony England, W0ORE, is the second US astronaut to operate an Amateur Radio station from the Space Shuttle back in 1985 as part of Mission STS-51F. During his career with NASA, he logged 188 hours in space. Now as the associate dean of academic affairs for the University of Michigan College of Engineering, a professor of electrical engineering and computer science, as well as professor of atmospheric, oceanic and space sciences, Tony is very interested in encouraging high school students to use Amateur Radio as a vehicle for developing their interests in science and engineering. Tony's after dinner presentation was titled "Amateur Radio/AMSAT: A Motivator for Careers in Science and Engineering" which was a series of 'short stories' of Tony's career where his Amateur Radio interests were key factors in his career as a scientist.

The intensity of Hamvention on Saturday was high immediately after opening at 0800 as the AMSAT Forum was scheduled from 0815-1045. Almost immediately after the commercial exhibits opened at 0800, a large crowd gathered in Forum Room 1. Moderated by Barry Baines, WD4ASW, the forum lead off speaker was AMSAT President Rick Hambly, W2GPS, who spoke on "AMSAT's Vision and Mission." Eagle Project Manager Jim Sanford, WB4GCS, gave an "Eagle Project Update." AMSAT-UK's Sam Jewell, G4DDK, gave the audience "An Update on SSETI Express/Student Satellite" which is expected to be launched later this summer. The last key presenter was Frank Bauer, KA3HDO, who gave a "Human Spaceflight Update (ARISS & Future Exploration Initiatives)." In between the key primary presenters, Drew Glasbrenner, KO4MA, gave the audience an update on VO-52 (HAMSAT) and how to take advantage of Amateur Radio's latest

satellite. Nick Pugh, K5QXJ, highlighted the upcoming AMSAT Symposium in Lafayette, LA. Nick is the team leader and 'host' for the upcoming Symposium. Those who wish to review the formal presentations given at the AMSAT Forum can review them online at: <http://www.amsat.org/amsat-new/articles/05DaytonPresentations/index.php>. This is the first year that we've had the Dayton Forum materials available online.

Also mentioned during Forum were the satellite demonstrations led by Drew Glasbrenner, KO4MA, and assisted by Jeff Griffin, KB2M, and Mark Hammond, N8MH. The satellite demos this year were an outstanding success. There were a total of nine demo opportunities over three days and literally hundreds of people were able to view contacts being made on FO-29, SO-50, AO-51 and VO-52. Some of those observing the demos were also given an opportunity to make their first V/S contacts on AO-51 as well. (Ed. – Your editor, WA4SWJ, made his very first satellite contact via FO-29 that day.) The addition of an 'introductory overview' by Emily Clarke, W0EEC, at the AMSAT Booth prior to each satellite was a new touch that was well received as well.

Gunther Meisse, W8GSM, videotaped much of AMSAT's activities at Dayton and captured the excitement of the satellite demos. The footage will be used for a number of AMSAT public relations and fundraising efforts as well as provide a means for highlighting AMSAT activities at Dayton in future Web postings. In addition to the satellite demos, Gunther took video of W0ORE's presentation on Friday evening, AMSAT booth activities, the AMSAT Forum presentations, and an interview given by Barry, WD4ASW, to Dayton AM radio station Information Radio 1610 during Hamvention which had a booth in Ballarena Hall. Gunther is working with Don Jacob, WB5EKU, a Los Angeles-based volunteer with professional video production experience to help put together these video packages. Expect to see their first release of the "AMSAT News Reel" posted on the AMSAT Web site in the near future. It will focus on AMSAT's participation in 'Space Day' at the National Air & Space Museum that took place prior to Dayton with a subsequent posting on Dayton itself (see article elsewhere in this issue).

On Sunday, Hamvention was open from 0800-1300. At 1200, AMSAT had its drawing for its Membership Incentive prize,

which consisted of a SSB Electronics UEK-3000 S-Band Downconverter. Jim Brooker, WZ8K, of Royal Oak, MI won this prize. New and renewing memberships were about the same as in 2004. Those that renewed at



Barry Baines, WD4ASW, interviews with Information Radio at their booth. (Photo by WA4SWJ.)

Dayton were able to take advantage of 2004 dues levels prior to the \$5.00 dues increase that took effect on June 1, 2005. Thanks to everyone who renewed their membership or joined AMSAT this year.

Sunday morning was a relatively quiet day at Hamvention. Consequently, a number of exhibitors started to take down their booths prior to the 1300 official closing of Hamvention. Given the slow pace of activity, volunteers at the AMSAT booth started the takedown process around 1230. The dismantling of the booth went very quickly, and with the help of various volunteers, boxes were loaded for delivery of AMSAT materials for Hamcom in Texas, Rochester Hamfest in New York and hamfests in New Jersey. The balance of the materials were shipped back to Silver Spring. The van was loaded with our booth equipment for delivery back to the storage locker. By 1400 the entire packing process was completed. Barry Baines, WD4ASW, and Gould Smith, WA4SXM, proceeded to the storage locker with the cargo van and were met by Rick Hambly, W2GPS, Tom Clark, W3IWI, and Robin Haighton, VE3FRH, who transferred our materials to the storage locker. After the van was returned to Budget in Fairborn, AMSAT's participation in the 2005 Dayton Hamvention was officially concluded.

Dayton Hamvention continues to be an exciting place for Amateur Radio. AMSAT certainly enhanced the overall scope of Hamvention with an outstanding booth display, a high degree of interest in our Forum and the opportunity to socialize and



exchange ideas. Our success is due primarily to the score of dedicated volunteers who handled setup and takedown, manned the booth during Hamvention, gave presentations at forums and elsewhere and represented AMSAT so ably during Hamvention. Thanks also to AMSAT Office Manager Martha Saragovitz who has a keen eye for detail, a willingness to keep the team 'on track' and the ability to deal with the myriad of Hamvention challenges with grace. As always, Dayton Hamvention was both physically demanding and a fun filled weekend coupled with a great sense of teamwork and cooperation that resulted in another success for AMSAT. Thanks!

As this article is being written, a photo album of Dayton images taken by Tom Clark, W3IWI, is currently available online: http://www.pbse.com/tomcat/dayton_2005. You will find a variety of photos relating to the booth operations, satellite demos and AMSAT Forum.

After coordinating AMSAT's participation at Dayton since 1996, it is time for me to hand responsibility over to new leadership.

In 2006 AMSAT Director-Field Operations Gould Smith, WA4SXM, will take over responsibility for AMSAT activities at Dayton. Gould ably assisted the process this year and is well qualified to handle a very visible and complex operation. Many thanks to each of you who have assisted AMSAT's efforts at Dayton over the years.

AMSAT thanks the following individuals for their time/support assisting AMSAT at the 2005 Dayton Hamvention:

Don Agro, VE3VRW, Toronto, ON
 Barry Baines, WD4ASW, Concord, NC
 Frank Bauer, KA3HDO, Silver Spring, MD
 Philip Berkowitz, WX1CT, Norwalk, CT
 Bob Carpenter, W3OTC, Rockville, MD
 Tom Clark, W3IWI, Clarksville, MD
 Emily Clarke, W0EEC, San Mateo, CA
 Ed Collins, N8NUY, Dayton, OH
 Jeff Embry, WI2T, Gaithersburg, MD
 Drew Glasbrenner, KO4MA, New Port Richey, FL
 Jeff Griffin, KB2M, Ocean View, NJ
 Robin Haighton, VE3FRH, Burlington, ON
 Rick Hambly, W2GPS, Severna Park, MD
 Mark Hammond, N8MH, Coats, NC
 Dee Interdonato, NB2F, Lodi, NJ
 Sam Jewell, G4DDK, Falkenham, Ipswich, UK

Ed Krome, K9EK, Columbus, IN
 Ed Long, WA4SWJ, Peoria, AZ/Fairport, NY
 Nancy Makley, KC8GYW, Dayton, OH
 Jerry Malin, N2HV, Matthews, NC
 Gary Joe Mayfield, KK0SD, Watertown, SD
 Lou McFadin, W5DID, Orlando, FL
 Robert McGwier, N4HY, East Windsor, NJ
 Steve Meuse, N1JFU, Boulder, CO
 Chuck Pinkham, K3PER, Annapolis, MD
 Jim Randall, N3YDT, Gaithersburg, MD
 Jim Sanford, WB4GCS, Eighty Four, PA
 Bill Schmitt, KD4CNS, Alexandria, VA
 Martha Saragovitz, Silver Spring, MD
 Dieter Schliemann, KX4Y, Scottsboro, AL
 John Shew, N4QQ, Silver Spring, MD
 Gould Smith, WA4SXM, Knoxville, TN
 Dave Taylor, W8AAS, Columbia, MD
 Ben Wright, K9DID, Appleton, WI



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P3E Transponder Meeting

by Frank Sperber, DL6DBN/AA9KJ

Translated from the German by John Bubbers, W1GYD

On January 22 and 23 the builders of the transponder for the Phase 3 satellite met in Marburg to clarify open questions and to further clarify the on-going events leading to the integration of the flight modules. The good news is all of the planned frequency work being done on the transponders and we are confident that we will be able to integrate all modules within this year.



Figure 1: Transponder meeting.

The participants to the meeting in alphabetical order: Michael Fletcher, OH2AUE, Jens Geisler, DL8SDL, Peter Gültow, DB2OS, Konrad Hupfer, DJ1EE, Mirek Kasal, OK2AQK, Petri Kotilainen, OH3MCK, Michael Kuhne, DB6NT, William Leijenaar, PE1RAH, Karl Meinzer, DJ4ZC, Gerald Moernaut, ON4EDA, Ulrich Müller, DK4VW, Helmut Neidel, DL1IN, Danny Orban, ON4AOD, Hartmut Päsler, DL1YDD, Janne Peltonen, OH1LRY, Frank Sperber, DL6DBN, and Heike Straube. The list of participants from Belgium, Finland, Czechoslovakia, the Netherlands and Germany clearly underscores the international character of the P3E project.

The easiest way to describe the results of the meeting is to list the individual modules in order. The modules have been given an identifying number for AMSAT-DL internal processing, which consists of a letter – in this case E for P3E – and a two-digit number. Eventually a further letter will be added if a second identical system is integrated. This is the case with the on-board computer and the STAR camera.

Module Overview

The actual list of modules is as follows in this table:

During the transponder meeting the modules

E01	Main Battery
E02	S-Exciter
E03	V/S Power Amplifier
E04	K-Transmitter
E05	P5 Coherent Transponder S/X
E06	U/V Transponder (optional 29-RX)
E07	L-Receiver
E08	Sensor Electronic Unit (SEU)
E09	Battery Charge Regulator (BCR)
E10	Auxiliary Battery
E11	Integrated Housekeeping Unit A (IHU3-A)
E11B	Integrated Housekeeping Unit B (IHU3-B/RUDAK)
E12	Ultra Stable Oscillator (USO)
E13	Liquid Ignition Unit (LIU)
E14A	Arizona Star Sensor A (STAR Camera)
E14B	Arizona Star Sensor B (STAR Camera)
E15	C-Receiver/R-Transmitter

E02, E03, E04, E05, E06, E07 and E15 were at their midpoint. They will now be reviewed in order.

E02 S-Band Transmitter

Danny Orban and Gerald Moernaut are completing this control transmitter for 2400 MHz in Belgium. For a long time there was no final decision as to where the exciter would be built, so this module is not yet up to the prototype stage. A further delay resulted in the frequency preparation, which is tied to the ultra stable oscillator (USO). A constant downlink frequency is thereby achieved that has hardly any variation – and is independent of temperature-based variations. If the USO should not be functioning, because of energy reasons, for example, then the S-band transmitter depends on an internal reference signal.

E03 Output Stage Module

The output stage module consists of three units: the 145 MHz amplifier, the 2400 MHz amplifier and the HELAPS-modulator to increase the operating level. Although Konrad Hupfert is contributing to both

amplifier areas, the HELAPS unit is from Gerald Moernaut. The V-band PA is flight ready to be integrated into the module. The remainder is still being worked on.

E04 K-Transmitter

The 2400 MHz transmitter is the one that is the most advanced. The housing of the flight module has already been delivered to Michael Kuhne. Helmut Neidel is guiding the beacon creation of the K-Transmitter as well as the transmitters for 145 MHz, 2400 MHz and 47 GHz. Additionally he has taken over the LF and PLL for the 24 and 47 GHz transmitters. The K-TX gets a reference signal from the USO for increased frequency stability.

E05 Transponder

It is not quite as easy to proceed with the experimental P5 transponder. In addition to Karl Meinzer's basic concepts, there have been several parts problems. The sticking points have not been fully eliminated so it can proceed expeditiously.

AMSAT-DL has entered completely new ground in Amateur Radio with this transponder, which explains the start up difficulties. The core operation of the transponder is the coherent mode. The transmitter synchronizes a highly simplified uplink signal from the earth station. This will simplify the acquisition of the downlink signals for the ranging which is used to determine the distance for interplanetary missions like P5A. The USO also delivers a

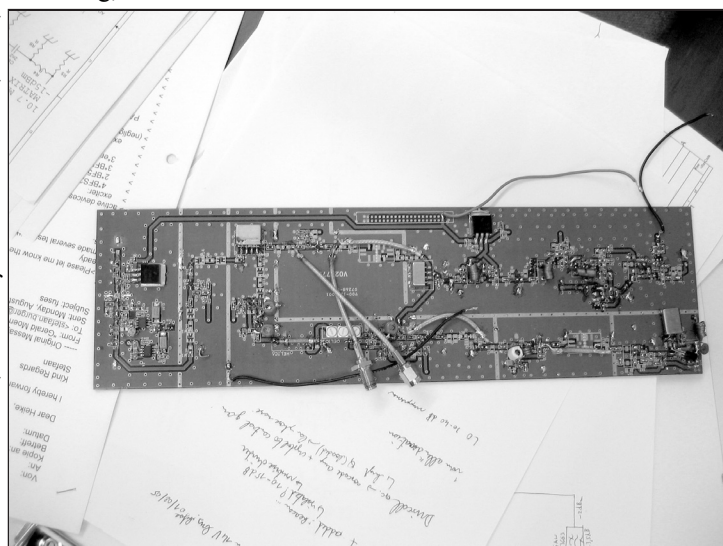


Figure 2: The layout for the S-band exciter; a first board for the prototypes was shown during the meeting.

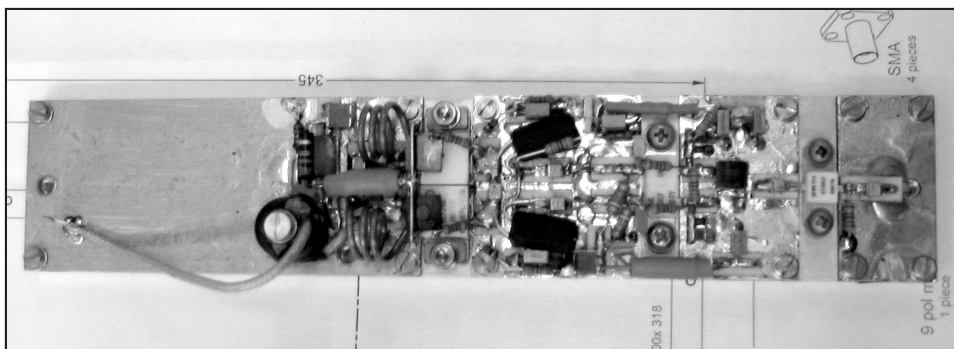


Figure 3: The operational sample construction of the 2-meter final stage module.

reference signal to the transponder.

During the transponder meeting the Finish group, Michael Fletcher, Janne Peltonne and Petri Kotilainen became interested in the transponder. The group had already performed a great deal of work on the preliminary approaches to the output stage of the transponder. The transponder should make alternate linear operation possible between S and X-band in addition to its experimental function for the P5 mission that can be further controlled by other uplink signals.

E06 U/V Transponder

Out of four offers to build a Mode-B transponder, that of William Leijenaar was

units by Helmut Neidel and the command receiver by Mirek Kasal. The Finish group is working on an additional 29 MHz receiver front-end that can be integrated into the transponder.

E07 L-Receiver

The L-band receiver from Mirek Kasal is as good as flight ready, which also contains the main command receiver. The receiver with its PLL can likewise be connected to the USO. The flight-ready module housing has already been delivered to the construction group.

E15 C-Receiver/R-Transmitter

This module has also made good progress and contains the 5.7 GHz receiver as well

this part. Parallel to the installation of the R-band receiver transmitter sections results in the C-RX.

Mode Combinations

In contrast to AO-40 there is no LF matrix on P3E that is able to individually connect receivers and transmitters with each other. This space was not available in consideration of the module complexity.

However, multiple connections of transmitters and receivers were taken into account. Under the current plan the following modes are possible:

A/V	29 MHz Uplink/145 MHz Downlink
U/V	435 MHz Uplink/145 MHz Downlink
U/S	435 MHz Uplink/2400 MHz Downlink
L/S	1268 MHz Uplink/2400 MHz Downlink
L/X	1268 MHz Uplink/10.5 GHz Downlink
L/K	1268 MHz Uplink/24 GHz Downlink
S/X	2448 MHz Uplink/10.5 GHz Downlink
S/K	2448 MHz Uplink/24 GHz Downlink
C/X	5669 MHz Uplink/10.5 GHz Downlink
C/R	5669 MHz Uplink/47 GHz Downlink

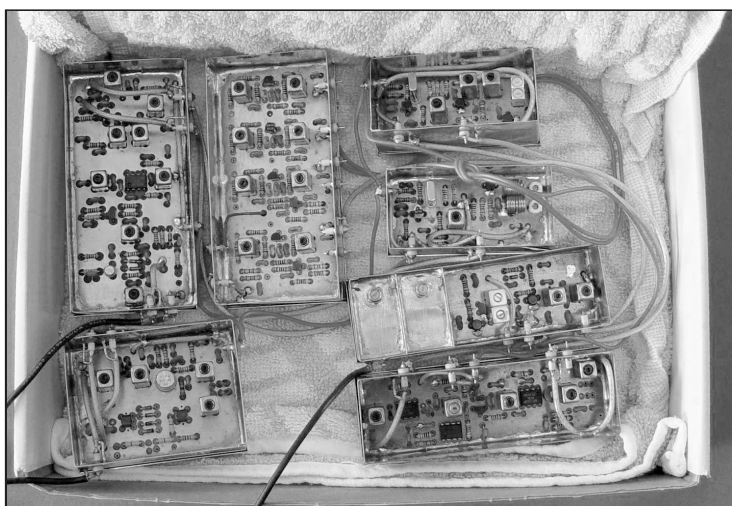


Figure 4: Transponder in a box – The individual modules (frequency processing, mixer, amplifier stages and IF) of the U/V transponder.

chosen and that one will fly. William is working feverishly under the pressure of leaving Europe for an extended period of time to make the transponder flight ready, which consists of a 435 MHz receiver and the 145 MHz control transmitter. The module housing for the flight hardware is under way as this article is being written.

The modular-built transponder will be completed with the inclusion of the beacon

as the transmitter for 47 GHz. The flight module has already been delivered to Michael Kuhne from AMSAT-DL. Helmut Neidel has placed the beacon, the LF section and the PLL that can be synchronized with the USO. Jens Geisler from the technical college has joined as a new addition to the project. He relieves Henning Rech with his work on the C-band receiver who, until now, had taken over the documentation for

The combinations of S-uplink and X-downlink take on a special meaning. Uplink and downlink are part of the P5 experimental transponder. This transponder, as further explained above, is intended primarily for the simulation and test of interplanetary communication. Alternatively it can also be operated in linear mode with a bandwidth of between 25 kHz and 50 kHz. The S-uplink

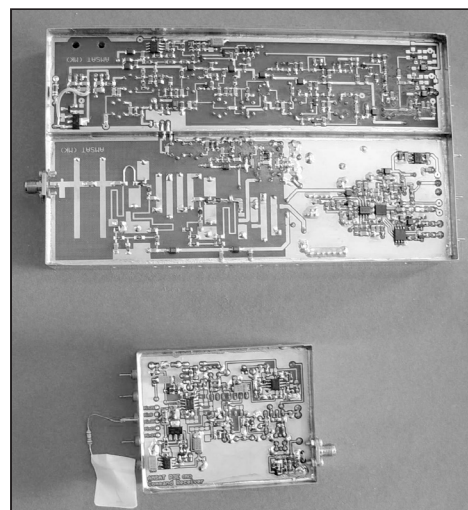


Figure 5: The L-band receiver (upper) and the command receiver (lower) for P3E.



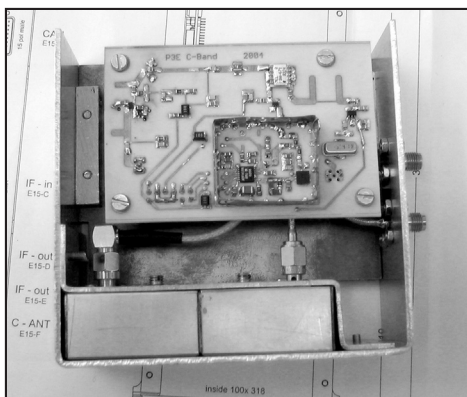


Figure 6: A first construction sample of the C-band receiver shows the compact construction (left under the filters).

passband can then be put onto another transmitter (K or R) or the X-band downlink transmitter can also transmit signals from the L- and C-receiver.

Based on the power budget and the thermal design of the satellite, only one transmitter can currently be operated at a time. In comparison, several receivers can be turned on at a time, so that mixed mode connections are conceivable. Consequently, if a station transmits on 435 MHz, a second one on 1268 MHz, both signals will be radiated on the 2400 MHz transmitter.

Key Word LEILA

For those who have been following the P3E news updates for a long time, it will be noticed that the well-known power limiting warning, LEILA, doesn't show up anywhere. In reality, no LEILA system will fly to indicate overly strong uplink signals.

There are many reasons for this. Most closely related is the lack of space on board P3E and in the individual modules. In addition, on AO-40 LEILA was closely connected to the IF matrix which is not available on P3E. Presumably this could have been solved accordingly with great effort.

The main reason, however, is the sensible use of the LEILA system under the given conditions. On AO-40 it could often be observed that the LEILA system marked so-called phantom signals. There were no useable signals at these points in the passband being received. The effect also showed up in the U-band as well as in the L-band uplink. In this case LEILA most likely recognized a radar pulse while scanning the pass-band and immediately placed the jamming signal on the just scanned point. There is radar use over the entire Northern Hemisphere on 70 cm as well as 23 cm. It

doesn't make much sense currently with this limitation for implementation on P3Express.

Only a further development of the LEILA concept, which eventually can handle such radar pulses using an "intelligent" DSP, could present a satisfactory solution. However, enough time for defining the P3E tasks was not readily available. Since LEILA only serves to compensate for the inadequacy of some few satellite users, the hope remains that with increased sensitivity the user will employ appropriate transmitter power.

The Antenna Situation

Unfortunately, the antenna configuration could not be completely cleared up. It is certain that the AO-10 and AO-13 familiar high-gain antennas for 145 MHz and 435 MHz will be installed again. It is presumed there will be no change in the three parabolic antennas with a diameter of about 15 cm. These reflectors are currently for the high-power output of the X-band transmitter, (10.5 GHz), the K-band transmitter (24 GHz) and in combination for the C-band receiver (5.7 GHz) and the P-transmitter

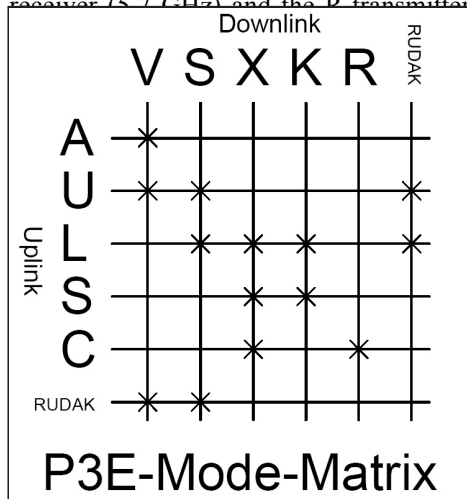


Figure 7: The Mode Combinations, as they are planned for P3E. At publication time the noted for 29 MHz (A-band) option for RUDAK was not included.

(47 GHz). According to all predictions the earlier helix antenna will be installed for L-band reception.

The question of an S-band high gain antenna and the omni-antennas for V/U/L/S and X is still to be clarified. All of these antennas should have as much as possible a symmetrical pattern and should not cause Doppler shift because of spin modulation. This phenomenon has been recognized since AO-13, in which a varying high Doppler

shift was presented from the S-helix situated at the edge of the satellite depending on the squint angle. It means that the still-missing antennas should be located symmetrically for rotation around the Z-axis on P3E.

Doppler must be considered because of the antenna location for the C/X High Power/K/R bands. Since the radiation angles of the antennas are very small, operation close to a 0-degree squint angle makes sense, which in comparison minimizes the Doppler shift.

The antenna question for the 29 MHz receiver (A-band) is completely unresolved. On the one hand, very large antenna structures cannot be used because of rotation dynamics. On the other hand it is unclear what will result from the self-generated noise spectrum on 29 MHz (switching controllers, oscillators, data circuits, etc.). The final GO/NOGO for this receiver can, therefore, only be made during the integration.

RUDAK

Nothing has basically changed in the matter of RUDAK. From questions and practical observations of the satellites it is clear that a RUDAK system is no longer timely in the sense of a mailbox. The Internet has very clearly moved away from the level of Amateur Radio. The advantage of a satellite like P3E in a high orbital plane lies in its ability to distribute news and information in real time.

Data services similar to the APRS position locating system or broadcasting news of DX clusters were considered in the early development phase of P3E. Particularly attractive, especially for younger users, could be a short news program, which is similar to that found on cell phones. Apart from other Amateur Radio infrastructure written contact could be made. In aid or catastrophic situations such a service could be useful.

In any event, with RUDAK there is the possibility of making the so-called Turbo-codes useable for general Amateur Radio not just for beacon and command purposes. The patent owner of the Turbo-codes, France Telecom, has licensed their use to AMSAT-DL for AO-40, P3E and P5A. Thanks to this coding method very weak radio signals can be communicated reliably.

Until now there has, unfortunately, been no group to take on the RUDAK project. The software part especially needs to be reworked. On the P3E hardware level there is already an operational computer on hand



in the redundant IHU-3. It could be used for RUDAK, as long as the primary IHU-3 can be put into service for satellite control. L-band and U-band receivers are already equipped with an IF output for RUDAK demodulators. And the transmitters for the V-band and the S-band can be steered on the IF level with RUDAK signals.

However, the connecting link (demodulators and modulators) between the computer and the IF level doesn't have a solution. So now it is important to conduct a system evaluation of the link budgets to be able to select in the short term a suitable design from the AMSAT-DL switching supply. On the transmitting side, for example, the multiple-use of the beacon could be employed, which can be modulated in BPSK and FSK/FM modes.

Summary and Prospect

In spite of its smaller antenna area and energy reserves compared to AO-40, P3E results in a satellite which can offer much to Amateur Radio. The transponder combinations achieve about the same diversity as AO-40. The anticipated signal strengths for the V, U and L bands will be similar to those of AO-10 and AO-13. P3E approaches the capabilities of the S2 transmitter on AO-40. In the next news release, once the power output of the flight modules has been measured, we will present a view of the individual link budgets for the known 12 hour orbit of AO10/13 and the 14 hour orbit presented by Viktor Kudielka [1] in the last *AMSAT-DL Journal*.

All of the module builders have much to do until then, while in the P3E laboratory everything thing is being prepared. Thus, things are progressing!

References:

[1] *Decisions for the P3E Orbital Path*, Viktor Kudielka, OE1VKW, *AMSAT-DL Journal* 1/2005, P.27



Postscript to "HT and AL800 Antenna – An Excellent Portable Satellite Station"

Allen F. Mattis, N5AFV, n5afv@amsat.org

Introduction

My article about using an HT and AL800 as a portable satellite station in the last issue of *The AMSAT Journal* resulted in many satellite operators commenting to me about how surprised they were that I was able to work low elevation passes with the small AL800 antenna. Since receiving those comments, I have been making an effort to work low elevation passes of FM LEO satellites whenever I can.

Discussion

At the time I wrote the article, the lowest elevation pass on which I had made contacts with my HT and AL800 antenna was a five degree elevation pass of AO-51. This pass was worked while I was at sea on a cruise ship and I had a totally clear horizon down to sea level. Also, the fact that I was located in a rare Maidenhead grid square caused many stations to attempt to work me, thus making it easier to make contacts.

My lowest elevation passes with contacts on other FM LEO satellites were six degrees on UO-14, seven degrees on SO-50 and eight degrees on AO-27. The graphs in which I plotted the number of contacts versus maximum degrees of elevation for passes of each satellite suggested that it was easier to make contacts on AO-27 than the other FM LEO satellites. I decided to try to work very low passes of AO-27 using an HT and AL800 antenna.

On May 31, 2005 I had the opportunity to work a four degree maximum elevation east pass of AO-27 at 2120 UTC. I had solid copy on the bird for approximately three minutes and made contacts with VE3OBP, N4QWF and KC8ZFN. On June 7, 2005 at 2122 UTC on another 4 degree maximum elevation east pass of AO-27, I was able to work N5UXT. I worked K9OIM on a six degree maximum elevation pass of AO-51 on June 8, 2005, and on June 14, 2005 I worked N4QWF on a five degree maximum elevation pass of AO-27. I did try working a three degree maximum elevation east pass of AO-27 and I heard the bird for about 20 seconds but was not able to make any contacts because of tall buildings on the horizon.

Conclusion

Using an HT with the small telescoping AL800 antenna provides exceptional portability and allows amateur radio operators to take a portable satellite station with them almost anywhere they go. It is not surprising that the AL800 antenna is becoming popular with those who operate FM LEO satellites.

References

Mattis, Allen, "HT and AL800 Antenna – An Excellent Portable Satellite Station" *The AMSAT Journal*, March/April 2005 (Volume 28, No. 2), pp. 21-23.



New Addition to The AMSAT Journal Staff

Please join me in welcoming a new addition to *The AMSAT Journal* Staff. He is Lee Herterich, K1VZI. Lee has already contributed to the Journal with new layout ads for SatPC32 on page 9 and a new AMSAT support ad on page 13. Lee can create graphics, advertising layouts and he has other capabilities in the graphic arts area. Please see his Web site at <http://www.color-copies.com> for more information. Thank you Lee and I look forward to improving the look of *The AMSAT Journal* even further.

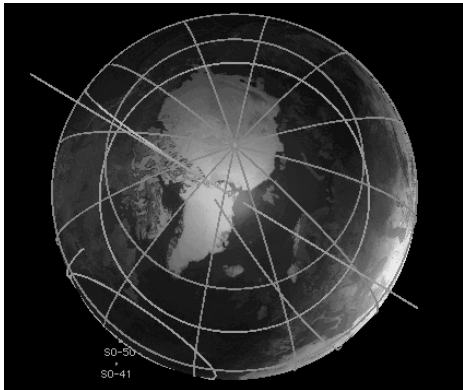
Bill Hook and John Bubbers continue to contribute significantly to the Journal. Without their help this would be a lesser publication.

Ed Long, WA4SWJ
Editor, *The AMSAT Journal*



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IHU3 Meeting

by Peter Gülzow, DB2OS

Translated from the German by John Bubbers, W1GYD

A Critical Design Review took place in Marburg (Germany) from January 26 to January 30, at which time all of the technical details of the new IHU-3 on-board computer for P3E and P5A were examined critically. The participants were: Bob McGwier, N4HY, Chuck Green, N0ADI, Lyle Johnson, KK7P, Stephen Moraco, KC0FTQ, Bdale Garbee, KB0G, Gerhard Metz, DG2CV, Hartmut Paesler, DL1YDD, Peter Gülzow, DB2OS and Heike Straube. In addition, the new AMSAT President Rick Hambly, W2GPS and Art Sepin, (ex-K6IWS) were present as guests on the 28th and 29th of January, to get an idea of the progress made on P3E. The opportunity was used for extensive discussions about further cooperative expansion. Frank Sperber, DL6DBN, who was able to attend the meeting for a day, answered Chuck Green's questions about the two AzSTAR cameras.



Figure 1: Team discussion during the IHU3 meeting. In addition to clarifications of the hardware, further software development was on the agenda. In addition to the implementation of IPS32, DSP-codes are also being developed.

A first operationally-capable IHU3 prototype was demonstrated and several measurements were made on the LF section. Instead of hardware modems, the modulation and demodulation is completely performed by software relative to the coding of the command signals and the telemetry beacon, and results in the so-called "Software Defined Radio" (SDR).

The tasks of the IHU3 team are clearly distributed. While Chuck Green and Lyle Johnson are concerned with the hardware and the construction, Karl Meinzer has already developed a new 32-bit IPS structure. The

first version ran on an Acorn Risc PC and was ported to the IHU3 via an on-hand cross development hardware tool on the ARM processor. Based on the IPS-D, which was used on the IHU-1, this version is called Version IPS-E.

Next we must develop several test software programs and additional software modules, especially the receiver software to run the Turbo codes at full speed.

Meanwhile, Bob McGwier has received an IHU3 prototype and is working on implementing further software modules so that IPS-E can be loaded into the new IHU3 hardware. This will happen using a software loader via the serial UART. Thereafter the software modems will be realized, which is a specialty of Bob's, at which he has been seriously engaged, having developed SDR for amateur radios. Stefan Eckert, DL2MDL, who unfortunately could not participate at the meeting, has already completed important preparation of the Turbo codes for the IPS.

Bdale Garbee will concern himself with the integration of the CAN functions in IPS-E, so that the CAN-DO can be adapted to the satellite. Stephen Moraco, who has written the software for the CAN-DO, will support him.

Beyond these activities, important progress is also planned for the ground installation, since currently the cross development hardware is available only for the Acorn RiscPS. PC's based on 80x86 architecture naturally are dominant in the IHU3 team and therefore the IPS development environment has to be available on this hardware platform in the future. The subject has come up that Bdale Garbee was project leader at the Linux Debian Project for several years and closely tied to Linux, both professionally and privately. The aim is to integrate IPS into the Linux system, that can also be used in real time and all development tools be available. Karl Meinzer and Bdale Garbee will intensively tackle this integration of IPS into Linux in May. Bob McGwier will further concern himself with the implementation of the Turbo codes for the uplink and downlink based on sound cards, so that the ground segment is covered especially for the command station.

A rigorous time schedule was put into place and the "mass production" of the IHU3 should start beginning in the middle of May, because, in addition to the flight units including backup, several engineering units will be required for software development and ground stations.

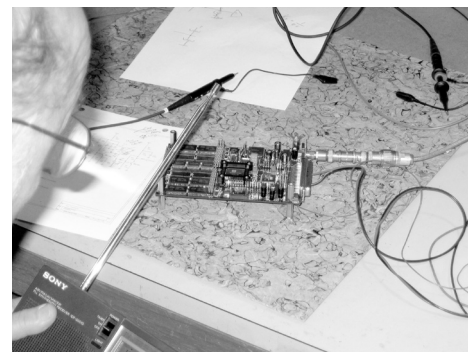


Figure 2: The IHU3 prototype on the workbench. Here the locking ability of the PLL oscillator is being tested while applying a highly stable standard frequency.

In addition to the IHU3, similar hardware will fly along for a RUDAK unit on P3E. Normally the IHU3A will perform the house keeping chores in the satellite. The similar IHU3B can likewise and theoretically undertake these chores, since all the I/O chores on the satellite flow through the CAN-Bus and the number of external crossover areas are minimal. Both IHU's have independent paths for command uplink and telemetry downlink, so that non-redundant switching will be generally avoided. If the primary IHU3A should fail, then the IHU3B could take its place at any time. The IHU's could either mutually monitor each other, or the

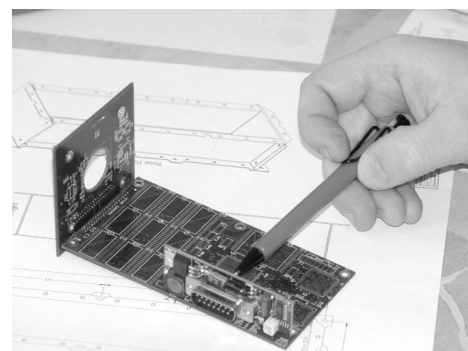
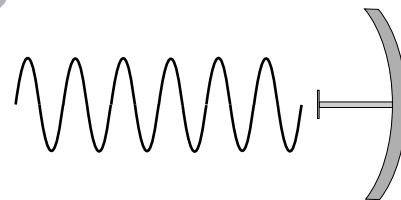


Figure 3: The unpopulated boards of the AzSTAR camera. The board for the image sensor is mounted edgewise. The large board is for the image memory and the processor is plugged into a CAN-do interface module.



switchover could, following suitable ground commands. As long as both IHU's perform without problems, the secondary IHU3B can readily take over the RUDAK chores. These new opportunities of the Turbo codes will make Amateur Radio more accessible and palatable. The reception of extremely weak RUDAK signals is imaginable and finally radio technology will reach as far as Mars and will be set up by P5A. However, the data rate thereby is then accordingly low. Currently under discussion is still which modem operation method for the uplink to RUDAK will be installed.

One thing is certain, that with the implementation of the IHU3, satellite radio is being revolutionized and new paths are being covered.



VASC Celebration

September 18-24, 1400 to 2100 UTC, KE4ZXW, Hampton, VA, VASC Amateur Radio Group, Inc., Radio Communications Exhibit celebrates 10 years at the Virginia Air & Space Center. Fully automatic, 9600 baud amateur satellite station and HF, VHF/UHF demonstrations to the visiting public. On the hour and half-hour, 7.265, 14.265, 28.365 MHz. Certificate, SASE to Ed Brummer, W4RTZ, 108 Oyster Cove Rd., Yorktown, VA 23692.

Note: Our automatic satellite station, KE4ZXW, established an unsurpassed performance record of seven years and two weeks of 24/7 operations until it was shut down to move it to another location in the museum because of major refurbishing of that section. The Virginia Air & Space Center is a world-class science museum and hosts over 250,000 school age youth and nearly half a million visitors annually! Many learn about ham radio for the first time from our on-duty station operators and hopefully a few will make a career in science or engineering as a result. Perhaps some will become Amateur Radio operators too.

73,
Ken Pierpont, KF4OW
Secretary



June 9, 2005: Rick Hambly, W2GPS, and Bob McGwier, N4HY, are in Rick's lab working on the design for Eagle's software defined transponder design along with Tom Clark, W3IWI (who took the photo).

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Students Projected into Space

by Maurice-André Vigneault, VE3VIG, ve3vig@rac.ca

On Saturday, May 14th, we had a chance to taste some of what our new AMSAT President Rick Hambly, W2GPS, was forecasting in the Jan/Feb 2005 issue of *The AMSAT Journal* for the future of Amateur Radio in space - continuous coverage.

The VE3JW Amateur Radio Exhibit station located at the Canada Science and Technology Museum hosted a group of students and parents from the R. Tait McKenzie Public School in Almonte, just outside of Ottawa. Neil Carleton, VE3NCE, a teacher at the school, leads a radio club for students, which involves shortwave listening and Amateur Radio activities. Neil invited some of his club members, and their parents, to the VE3JW station to have them experience Amateur Radio from a fully operational station covering all modes.

Girls and boys ranging from 7 to 12 years old were given an introductory presentation of the station covering a bit of the history and some of our equipment. Then, we asked the question: "Who would like to hear their own voice bounce off a satellite?" They immediately all lined up and anxiously awaited their turn at the microphone.

Beforehand, I wrote down a list of potential

satellites whose footprints across North America would allow us to demonstrate space communications. Fortunately, the remaining workable satellites were coming at us in close succession.

We started with FO-29, a single sideband satellite. Although its elevation was minimal, we had a very successful contact with Leo, W7JPI, in Arizona. We explained to Leo what we were up to, with some students at the museum station. We discarded the earphones (a no-no in satellite work) in favor of speakers to provide more interest in the group. The first student set the tone as her clear voice was projected into space and came back clearly for all to hear. Faces lighted up, eyes popped and no one was mike-shy as they took turns talking with Leo.

As FO-29 faded we quickly moved over to the AO-51 frequency, an FM satellite. We immediately made contact with Dan, AJ9K, in Wisconsin, who had been listening on FO-29 and knew about the students. More of the group was able to make contacts as Dan patiently followed the bird in space until we reached the lower marks on the elevation scale.

SO-50, another FM satellite, was immediately

available. As a demonstration of the versatility in satellite communications, Bill, K7MT, in Montana copied our signal and responded with a "handheld setup". As we logged our last contacts with Bill we seemed to lose the satellite momentarily. Other stations threw in their call signs to offer help.

We completed the group's visit with HF PSK31 contacts into the UK and Italy. However the highlight remains the contacts via the consecutive satellites.

We would like to thank Leo, Dan and Bill for their excellent participation during our demonstration, for their patience with the students and the noise level at the Museum, and for the great help they have provided to Amateur Radio. You have made students and parents a happy group and we hope this will contribute to the development of future licensed amateurs. Also, we would like to thank all those Amateur Radio stations that have shown excellent cooperation during our contacts, especially on a Saturday afternoon when so many stations are free to tune in.

If this is what 'continuous coverage' will be about, we're certainly willing to help fill the budget bucket for future satellites.

For a look at the VE3JW setup go to:

<http://ve3jw.tripod.com> 



Satellite Beginner's Column

Gould Smith, WA4SXM, wa4sxm@amsat.org

There have been some requests to have a column for those new to amateur satellites. So, in response to these requests, I will write a Beginner's column for a few issues and see what the response is. I will take on some of the more unfamiliar areas that are new to beginning satellite operators and discuss them and their effect. Please let me know if you find these columns helpful or if you have any questions.

Doppler Shift

An important fact, but one often not considered by beginning satellite operators, is the effect that a moving satellite has upon reception of the signals transmitted by the satellite. We all remember the high school science explanation of the change in the frequency of the sound of a train's horn as it passes you by as Doppler shift. Well, sound shift and RF shift are of widely differing frequencies, but the frequency shift in both is based upon the same principle that a shift occurs when the source is moving with respect to the receiver. In satellite operation you don't hear the sound change, but you do observe the need to change your receiver's frequency to keep the signal in the passband as the satellite approaches and then recedes. The amount of Doppler shift observed depends upon the transmitted frequency and speed of the satellite relative to the observer. Essentially, the higher the frequency and the faster the satellite is moving, the more the frequency shifts due to Doppler shift. Stations in different locations will experience a different Doppler shift from the same source.

If you are interested in the mathematics and

a through discussion of Doppler shift, I refer you to Chapter 8 in Martin Davidoff's, *The Radio Amateur's Satellite Handbook*.

The practical effect of Doppler shift to satellite operators is that you can't listen on the published frequency and hear much of the pass. It is necessary to continually retune your receiver during the pass to receive the signal transmitted from the satellite. Many

shift during a pass is twice that value.

During an AO-51 pass you will experience a 20 kHz shift in the received 435.300 MHz frequency satellite transmitter frequency. The Doppler shift will cause the initial 70cm receive frequency to be 10 kHz higher than the published downlink frequency. If you are listening on the actual transmitted frequency, you won't hear the signal until it

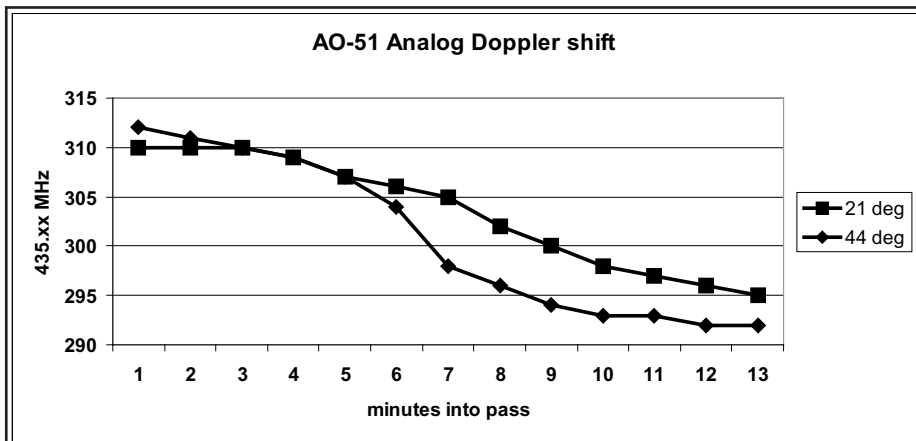


Figure 1
Measured 70cm Doppler shift from AO-51, about 20 kHz

of the current amateur satellites transmit on 70cm (435 MHz). The Doppler shift during a standard fifteen minute pass is about 20 kHz. Since most radios will receive signals in a passband about 2.5 kHz around the selected frequency, you will miss a great deal of the transmissions, unless you follow the Doppler shifted signal's changing frequency. Table 1 shows the representative Doppler shifts for the most common amateur satellite bands. Note that the shift is given as $\pm$, so the total

is approaching mid-pass. I recommend that you set your hand held frequency steps to 5 kHz and tune down during the pass to keep the signal centered in the passband.

The downlink signal will start high, move through the standard frequency at mid-pass and go about 10 kHz lower at the end of the pass. This isn't a linear change either. The Doppler changes fastest during the middle part of the pass, see Figure 1. Note how the frequency remains fairly constant (although 10 kHz high) during the beginning

Wavelength	Frequency	Doppler Shift
2M	145 MHz	± 3.25 kHz
70cm	435 MHz	± 9.75 kHz
23cm	1.269 GHz	± 28.5 kHz
13cm	2.401 GHz	± 53.8 kHz
5cm	5.750 GHz	± 120.0 kHz
3cm	10.250 GHz	± 230.0 kHz

Table 1
Doppler shift by band for a 15-minute pass.

Time into Pass	Frequency
Beginning of pass	435.310 MHz
4 minutes into pass	435.305 MHz
7 minutes (mid pass)	435.300 MHz
9 minutes into pass	435.295 MHz
11 minutes into pass	435.290 MHz

Table 2
AO-51 suggested Doppler tuning



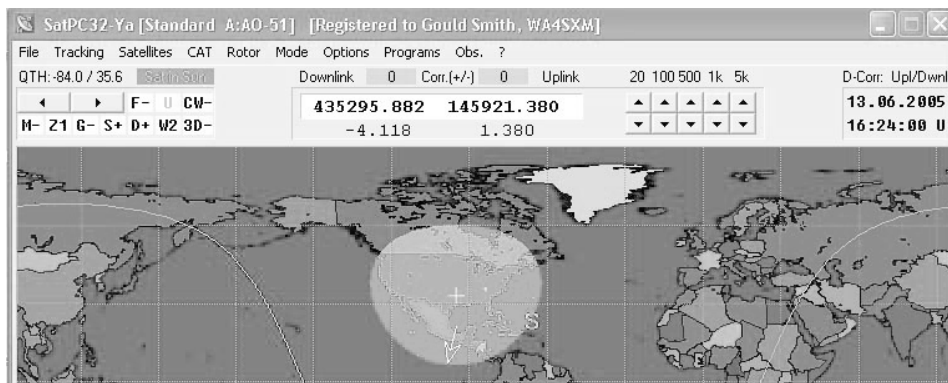


Figure 2
SatPC32 screen showing Doppler shift.

of the pass and quickly moves through the published frequency at mid pass, then is fairly constant again during the end of the pass. Another thing to notice in Figure 1 is that the higher the maximum elevation of the pass the faster the Doppler changes during mid pass. The slope of the line in the Doppler graph increases during TCA (Time of Closest Approach).

Although your uplink frequency also experiences Doppler shift from the satellite's viewpoint, the 2M shift (about 6 kHz) is less since the frequency is lower. You can keep your radio on the 145.92 MHz uplink frequency without changing it. Since most hand held radios don't tune finer than 5 kHz, you have no choice but to leave it on the published uplink frequency.

On the other hand, if you operate AO-51 during Experimenters' Wednesday when the L band, 1.2 GHz uplink is being used, it is necessary to adjust for the Uplink Doppler as well as the Downlink Doppler. In Table 1 note that the 1.2 GHz signal will shift about 60 kHz during a pass from the satellite's viewpoint. Of course, while listening to the S band downlink expect a whopping 100 kHz shift during the pass. This means twenty, 5 kHz frequency changes during a 12 minute pass – one about every 36 seconds. If the satellite is in the L/S FM repeater mode you are doing quite a bit of frequency changing on both bands. When you have to adjust for Doppler on the uplink, it will need to be moved from a lower frequency to a higher frequency – the opposite of the downlink.

Most tracking programs will give you

Doppler shift information, if you have supplied reference frequencies like the beacon frequency. Figure 2 shows how the SatPC32 displays the current uplink and downlink Doppler corrected frequencies. The displayed Doppler corrected frequency is currently 435.295 MHz, lower than the standard 435.300 MHz. This shows that the pass is past TCA (Time Closest Approach), actually about $\frac{3}{4}$ of the pass is complete and the shift is going lower. Also note how the Doppler corrected uplink is still 145.92 MHz, so the programmed frequency on your handheld is still good. The uplink frequency is higher than the standard 145.920, because it is moving higher in frequency during the pass. Many of the tracking programs will actually control the Doppler shift automatically if your satellite radio has a serial port interface (CAT control). After setting the tracking program up for your radio and serial port, just activate the CAT tuning control and it will keep your desktop radio on frequency.

Remember that the higher frequency will be affected more than the lower frequency. So, this is the band to tune. Just to make things interesting, when using a transponder like VO-52, the downlink can move higher in frequency. We will talk more about how to tune during a QSO in a future column.

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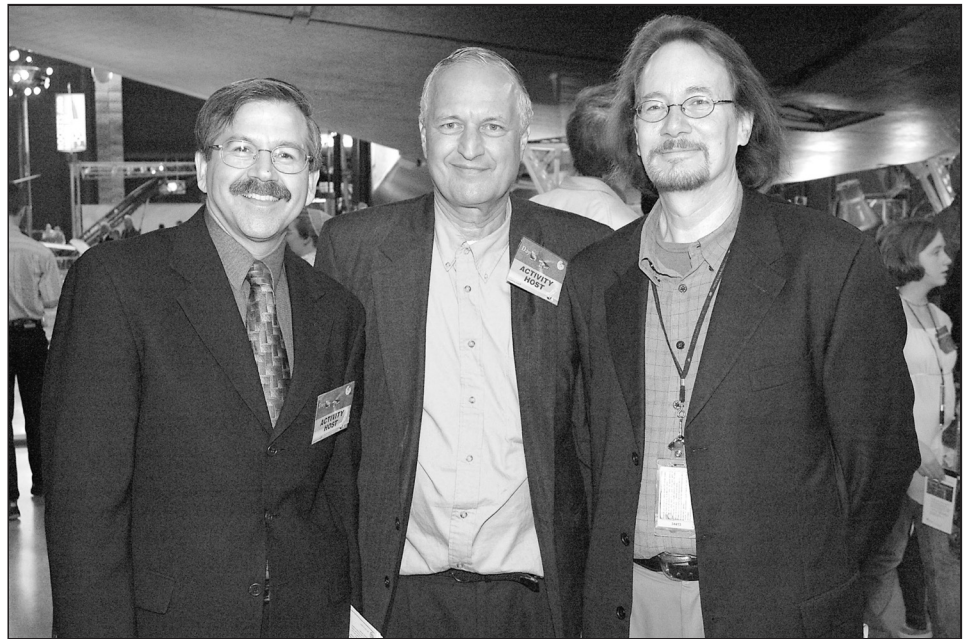
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AMSAT Representatives at the Smithsonian

by Perry Klein, W3PK,
w3pk@amsat.org

Over a dozen AMSAT representatives took part in Space Day, May 5, 2005 at the Smithsonian National Air and Space Museum's Udvar-Hazy Center located near Dulles Airport. We set up an exhibit in the Space Hangar near the display case where OSCAR 1 and PCSAT are on permanent exhibit. We showed CalPoly's CUBESAT model. Members of the ARISS team showed amateur hardware from the International Space Station and demonstrated the new slow-scan TV system slated to be delivered to the ISS later this year. Around fifteen hundred students were brought in for the event. The museum was open for extended hours to 9 PM on Space Day so families could attend later in the day. ☾



Frank Bauer, KA3HDO and Perry Klein, W3PK with Dr. Martin Collins, the Air and Space Museum Curator who arranged the OSCAR 1 and PcSAT display-case. (Photo by Art Feller.)



Frank Bauer explains ARISS to students from Eastern Middle School. (Photo by Art Feller.)



The AMSAT Space Day exhibit was located behind the Space Shuttle Enterprise, next to the display case containing OSCAR 1 and PcSAT. (Photo by Art Feller.)



Mark Kanawati, N4TPY, shows school children the components that go into small pico-satellites. (Photo by Art Feller.)



The Smithsonian National Air and Space Museum's Space Day 2005 was held at the Udvar-Hazy Center. Here is the group at the exhibit. The display case to the right has OSCAR 1 and PcSAT on permanent display. (Photo by Dick Daniels.)



Gunther Meisse, W8GSM, Art Feller, W4ART, and Perry Klein, W3PK, in front of the display case containing OSCAR 1 and PcSAT. (Photo by Dick Daniels.)

AMSAT at the 2005 Rochester, NY Hamfest

by Richard F. Crow, N2SPI, n2spi@amsat.org

The first full weekend of every June heralds the annual Rochester (NY) hamfest: www.rochesterhamfest.org. This is a major hamfest in the northeastern United States, which runs for 3 days. It boasts 6,218 attendees (2004), 35 commercial vendors and hundreds more in a huge outdoor flea market. All this on the 50 acre Monroe County Fairgrounds, which includes a large exhibit hall housed inside a concrete dome structure.

And for this year's 2005 Rochester Hamfest, AMSAT was there. From June 3rd through June 5th, Friday, Saturday and Sunday, AMSAT set up shop at booth 45 inside the Dome Center.

Before the Hamfest

But first, some background. In my experience, most of the hams at the Rochester hamfest are "non-satellite" hams. Many of these non-satellite hams are interested in satellite radio, but feel it is an impossible dream because of the perceived high cost and rocket science involved. As a result, they are understandably reluctant to support AMSAT. So, I thought, if we can show these hams, step by step, how they can affordably succeed at working the amateur satellites, the more likely they might be to support AMSAT and become members.

So, with this in mind, the theme I chose for the 2005 AMSAT booth was: "It's not as expensive, or as difficult, as you think to work the ham sats. Let us show you how."

To support this theme I engaged in three efforts to demonstrate to non-satellite hams how they too could become operational on AMSAT's current flagship satellite, AO-51.

I. The first effort was to put together a display at the AMSAT booth of no-cost or low-cost equipment needed to access AO-51. This display featured six items as follows:

- 1) Satellite Tracking - FREE
 - Get Latitude/Longitude of your location, etc. at www.heavens-above.com
 - Download the SatPC32 demo satellite tracking freeware, etc. at www.amsat.org
- 2) Satellite Antenna - \$25 or less
 - Build a homemade, handheld 146/435

MHz "Arrow Style" antenna by combining a 3-element 146 MHz with a 6-element, 435 MHz "Cheap Yagi" found at www.clarc.org/Articles/uhf.htm (Google "cheap yagi").

** or **

Satellite Antenna - \$73.00

- Arrow Antenna 146/437-10 Satellite Antenna at www.arrowantennas.com

3) 435 MHz Preamp - \$39.00

- Hamtronics LNY-400 Preamp (without case) at www.hamtronics.com

** or **

435 MHz Preamp - \$59.00

- Hamtronics LNK-400 Preamp (with case) at www.hamtronics.com

4) 435 MHz Receiver - No Cost

- if already have a 440 MHz HT, Mobile rig, UHF Receiver, or Scanner
- must have 5 kHz, or less, tuning steps

** or **

435 MHz Receiver - \$89.99

- Alinco DJ-S40T pocket-sized UHF HT at www.aesham.com, etc.

Headphones, Full Cup - \$19.99

- Vanco HF-24RS at www.aesham.com, etc. (prevents audio feedback)

6) 146 MHz Transmitter - No Cost

- if you already have a 146 MHz HT or mobile rig
- must be able to transmit a 67.0 Hz subaudible tone

** or **

146 MHz Transmitter - \$95.99

- ICOM IC-T2H Sport 2m 6W HT at www.aesham.com, etc.

The prices shown are what I paid to purchase these items new in the spring of 2005. "Used", "hamfest" or "ebay" prices could be significantly less.

II. The second effort was to perform a number of AO-51 demonstrations at the Hamfest using the specific hardware listed above. The antenna was the homemade 146/435 MHz "Arrow Style Cheap Yagi(s)". This would prove the effectiveness of this no-cost/low-cost

gear to make actual AO-51 contacts. However, to assure success for the Hamfest demo(s), which unfortunately had to take place on Saturday and Sunday mornings, I did plan to substitute my toolbelt-portable ICOM IC-2100H, 2m mobile for the IC-T2H HT.

III. The third effort was to produce, what I call, the "AMSAT Audio Theater". AO-51 contacts were recorded, using the equipment above, for playback at the AMSAT Booth. This would allow those who missed the demo to hear what working AO-51 actually sounded like.

Friday, June 3

This was the opening day at the 2005 Rochester hamfest. The flea market opened at 6:00 AM local time. But the Exhibit Hall, where the AMSAT booth was, didn't open until 12:00 noon.

When Booth Assistant #1, a.k.a. my wife Sally, KC2CCE, and I arrived, we were surprised to see two other hamfest helpers already there. We found Dave Oman, VE3SAT, and his wife Anne standing in the lobby of the hamfest Headquarters Hotel. On many a previous hamfest Friday, I found myself manning the booth alone.

A little later, while setting up the booth, we were again surprised to see the rest of our team, Rick Hambly, W2GPS, (you all know who he is) and his wife Elaine, N3HMW. I'd never seen so many helpers show up on the first day.

Thank you all. Unfortunately, the weather was hot and muggy. The Dome Center air conditioning was off. We didn't do very much business.

Saturday, June 4

Saturday started off with a bang when the Exhibit Hall opened at 8:30 a.m. local time. At times Dave, Rick and I were simultaneously engaged in promoting AMSAT and satellite radio. Sally handled all the money, bookkeeping and kept track of inventory.

There was much interest in the satellite equipment display. Many asked for free handouts detailing the equipment shown. At last year's hamfest, I gave away hundreds of free handouts for that year's display. But this year, I didn't have the time to print any.



I'll definitely bring a stack of free handouts next year.

On Saturday we ran three successful AO-51 demos on the 13:51, 15:29 and 17:09 UTC passes. Apparently there is a lot of interest in AO-51. More people showed up for these demos than for any of the other satellite demos I've done the previous four years. On just about all passes, Robin Haighton, VE3FRH, responded to our CQ and gave the assembled onlookers "the pitch" for becoming an AMSAT member.

Also, *AMSAT Journal* Editor, Ed Long, WA4SWJ, visited for a couple of hours in the morning and took some photos (some of which accompany this article - Ed.).

Business in the morning was very good. Unfortunately, the flea market crowd started pulling out midday Saturday perhaps because of a modest amount of rain which fell in the morning. The flea market was just about gone Saturday afternoon and afternoon business was very slow. But we all stuck it out until the Exhibit Hall closed for the day at 5:30 p.m.

Sunday, June 6

Influenced by events on Saturday, Sunday was the slowest I've ever seen it. Nonetheless, when the doors opened at 8:30 AM local time, the whole AMSAT team showed up to man the booth. We ran two successful satellite demos on the 13:13 and 14:50 UTC passes of AO-51. Several interested people attended each. At 1:30 PM local time, the Exhibit Hall doors closed for good and the 2005 Rochester hamfest was history.

Final Thoughts

In the end, we raised some money for AMSAT, but it was about half the amount compared to other years. Though there was a lot of interest in the satellite equipment display and the AO-51 demos. We unfortunately sold no AMSAT member-ships.

To the many who assisted us in a myriad of ways, with setting up and running the 2005 AMSAT booth, I thank you all. I'd like to express particular appreciation to: Dave Oman, VE3SAT, Anne Oman, Rick Hambly, W2GPS, Elaine Hambly, N3HWM, Robin Haighton, VE3FRH, Harold Smith, K2HC, Dave Payne, KA2J, and, most importantly, Sally Crow, KC2CCE.

We'll be back again next year to try again harder. Y'all come by and see us now - ya hear!



The AMSAT booth at the 2005 Rochester, NY hamfest with Sally, KC2CCE, in charge. The no-cost/low-cost satellite equipment display is behind Sally. The speaker for AMSAT Audio Theater is at the left front corner.



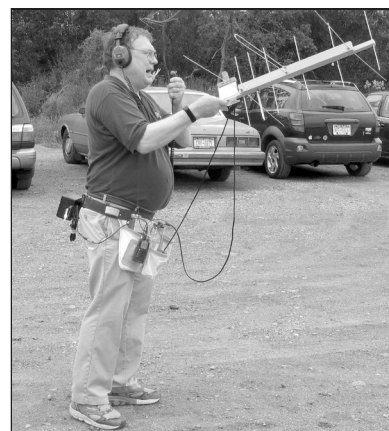
(left to right) Rick Hambly, W2GPS, Dave Oman, VE3SAT, and Richard Crow, N2SPI, man the AMSAT booth at the 2005 Rochester hamfest.



Richard Crow, N2SPI, demos his no-cost/low-cost satellite gear during an AO-51 contact at the 2005 Rochester hamfest.



Close-up of Richard's homemade dual band antenna. It works great!



AO-51 low-cost equipment in action: (left to right) anti-feedback speaker (at back of toolbelt - for demo only), Vanco HF-24RS headphones, Timex radio controlled wristwatch and Az/EI/Doppler Tracking Printout (on antenna boom at right hand), homemade no-solder, EZ-build 146/435 MHz antenna.



Richard Crow, N2SPI, explaining no-cost/low-cost satellite gear to interested attendee at the 2005 Rochester hamfest.



Richard acquiring AO-51 as onlookers see a live demo of techniques explained minutes earlier in the AMSAT booth.



Field Day 2005

by Richard M. Hambly, W2GPS, w2gps@amsat.org

This year's Field Day is only hours old and I am pleased by my experiences. I decided that, as AMSAT president, it would be appropriate for me to visit four Field Day sites to encourage those sites that have satellite stations and to show the others how easy it would be for them to set up stations next year.



Figure 1: AARC setting up at old Nike Missile site.



Figure 2: John, K8JW, setting up the AARC GOTA station.

My first stop was to the field day site of the Anne Arundel Radio Club, W3VPR. I have been a member of this club since I moved to Maryland about 19 years ago.

Club members were busy setting up on an old Nike Hercules missile system radar site that is now the home of a county recreation facility in Davidsonville, Maryland.

The AARC club ran four stations in class 4A plus a Get-On-The-Air (GOTA) station but did not have a satellite station this year.

I received some help modifying my mobile satellite equipment from Butch, N3KVP, and assisted AMSAT member John Williams, K8JW, in setting up the GOTA station. Perhaps next year a satellite station can be set up here.

My second stop was to the AARC Jr, which

bills itself as "an Amateur Radio Club Just for Kids, where kids become radio active and ham radio is considered a contact sport." Their call sign is KI3DS, which fits perfectly. The Field Day site was located on the grounds of the Grace Evangelical Presbyterian Church in Davidsonville, Maryland.

AARC Jr. led by club founder Bill Rose, AA3RR, had an aggressive Field Day plan with about 20 kids scheduled to take part. They operated in the 4A category with three HF SSB stations, one HF CW station, a VHF station (6M) and a satellite station.

Power was provided by a 5.5kW generator fed into an uninterruptible power supply (UPS), which in turn distributed power to all the stations and the mess tent.

This was the site of the satellite station using



Figure 3: AARC Jr. club members setting up the visitors tent.



Figure 4: Adam, KB3KVD, (right) and his friend Aaron at the AARC Jr. satellite station anxiously waiting for the start of Field Day.

My third stop was to Sea Bee Beach in

Annapolis, Maryland, immediately across the Severn River from the U.S. Naval Academy. This year two separate Field Day teams decided to locate in the same place and share food, power and camaraderie while competing with each other as separate teams.

The first team was from a company sponsored club, the ARINC Amateur Radio Club operating under the call W3ZH. This team was led by my old friend Neil Bloomberg, W3NTP, Vice President of ARINC ARC. He and I worked together when I worked at ARINC from 1986 to 1996.

The ARINC ARC president Bruce Becker, N3KNP, was quoted in an ARINC press release saying "We are extremely excited to be working alongside the USNA Radio Club for this event. Field Day will give both clubs a chance to display their knowledge of radio communications and emergency preparedness while training and improving our grasp of ham radio technology."

The second team was from the United States Naval Academy Amateur Radio Club. The team advisor was Chief Scott Snyder, KG6ERY, head of the USNA Radio Club. Also present was AMSAT member Bob Bruninga WB4APR. The primary operators were mid shipmen Shaw MacEwan, KD7FPS, and Ensign Dan Trembula, KG4DRA. The team was operating two HF stations using military HF equipment. This high quality gear suffered from one major deficiency - neither radio had a knob! How many of you could operate Field Day from a keypad, I wonder?

Later in the day, after I had left, Bob WB4APR helped the Naval Academy Amateur Radio Club successfully work some satellite contacts.

I stopped at home and picked up my wife



Figure 5: ARINC ARC members Rob Renoud, K3RWR, and Neil Bloomberg, W3NTP, getting ready to start operating just before the start of Field Day.

Elaine, N3HMW, for the trip to the final location, which was the world class site of W3AO, a joint Field Day operation of the Columbia Amateur Radio Association and the Potomac Valley Radio Club. The operation was located on the grounds of the Triadelphia Ridge Elementary School in Ellicott City, Maryland.

Operating 21A this year, this is one of the



Figure 6: Shaw, KD7FPS, and Dan, KG4DRA, are operating the United States Naval Academy Amateur Radio Club, Field Day station.

foremost Field Day operations in the United States and often comes in first place overall. The HF operators had a rare treat this year as they were given a huge air conditioned tent courtesy of a medical systems company that was demonstrating the tent to homeland security officials who visited the site. Each HF station is connected to a monoband beam on a 40 foot portable tower and tuned for either the voice or CW section of the band.

The Columbia Amateur Radio Association has enough interest in satellite operation that they host the “CARA Satellite Group” otherwise known as CARAsat. Art Goldman, N3OY, and Ed Cabc, N2EC, led the satellite effort this year. The satellite team was not able to fit into the air conditioned tent so they had to brave high temperatures and humidity. Even so, the bright sunshine and slight breeze was preferable to the severe weather of some previous years.

Elaine, N3HMW, and I provided advice and moral support as Art, Ed and others tried to work nearly every satellite pass that was available. It was pleasing to see that we have enough satellites working that we were nearly always active. The team was hampered by new software and hardware, both with steep learning curves. Even so, they made contacts and generated interest in satellite communications both among the HF operators and visitors to the site.



Figure 7: W3AO's air conditioned tent was host to separate CW and SSB stations for every band. This view shows only about half of the stations.



Figure 8: Ed N2EC in front of the Columbia Amateur Radio Association satellite tent.



Figure 9: Art N3OY at the controls of the Columbia Amateur Radio Association satellite station.



23rd Space Symposium & AMSAT[®] Annual Meeting October 7, 8 & 9, 2005 - Lafayette, LA Registration Form

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Be sure to indicate that you are with AMSAT in order to qualify for the special room rate.

Airport Information:

Lafayette Regional Airport (LFT) is serviced by Delta, Continental and Northwest Airlines. Connections to LFT are through Houston, Dallas/Fort Worth, Memphis and Atlanta. For more information visit the Lafayette Regional Airport website. More direct flights are available to Baton Rouge, approximately 60 miles from Lafayette and New Orleans, approximately 130 miles away.

Train and Bus:

Lafayette is serviced by AMTRAK and is a stop on the Sunset Limited (Los Angeles to Orlando.) Trains run east and west approximately every 3 days. Lafayette is also serviced nationally by Greyhound.

The Lafayette Transit System (LTS) runs local bus service from 6:30am to 11:30pm. Fares generally run \$0.75 for adults and there are child and senior discounts. A day pass is available for \$2.00 per day.

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HamSat Launched!

by Nagesh Upadhyaya, VU2NUD, AMSAT-India
and Ed Long, WA4SWJ, Editor, *The AMSAT Journal*, wa4swj@amsat.org

The Amateur Radio community gained another orbiting resource – HamSat or VO-52 when it was launched from India on May 5, 2005. It went into operation almost immediately and is functioning very well.

The Indian Space Research Organization's Polar Satellite Launch Vehicle-C6, carrying India's remote sensing satellite CARTOSAT-1 and a microsatellite HamSat, blasted off from the Satish Dhawan Space Center in Sriharikota at 10.22 Hours IST and HamSat was inserted to a Near Circular Sun Synchronous Polar Orbit (628 km) at 10.41 hrs IST.

This small satellite has many "firsts" to its credit.

1. It is the first time that two Indian satellites

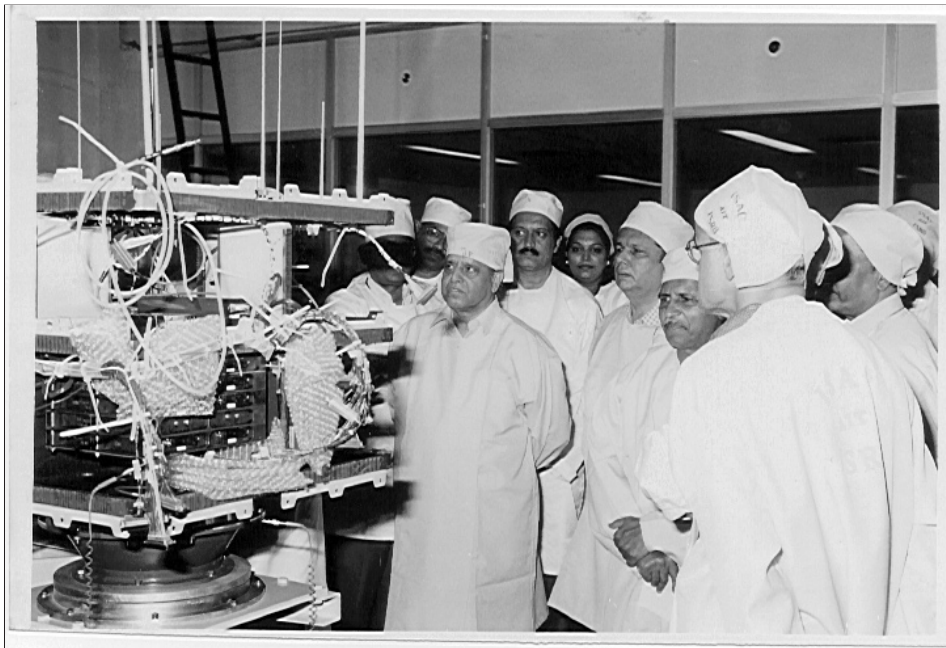
were launched from an Indian Polar Satellite Launch Vehicle(PSLV)

2. It is the first theme-based satellite from ISRO

3. It is the first microsatellite made and launched from India

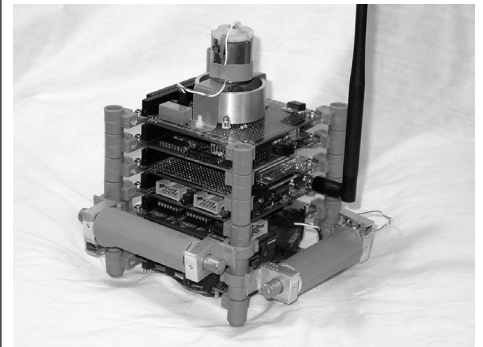
4. It is, of course, the first-ever Indian Amateur Radio satellite

The satellite was launched into a 621 km near circular Sun synchronous polar orbit on May 5, 2005. It has an orbital inclination of 97 degrees and period of 97 minutes. The next day after launch, the main payload was switched on in the U/V mode and the reports have been very good. The satellite is expected to last for about 10 years. In accordance with AMSAT conventions, it has been named VUSAT-OSCAR-52 or VO-52 and is the latest satellite in the series.



This photo (courtesy of ISRO) shows (L to R): Dr. K. Kasturirangan (Member of Parliament and ex-Chairman ISRO), Nagesh Upadhyaya, VU2NUD, (Senior Scientist ISRO, founder and co-coordinator AMSAT-India), Dr. Madhavan Nair (Chairman, ISRO) and other officials. Dr. Madhavan Nair, who took over the reigns from Dr.Rangan, has been very enthusiastic about the project from the beginning and has seen to it that the program is a success. Comments from Nagesh on the picture: The photograph shows HamSat during fabrication. This satellite was approved by ISRO during the tenure of Dr. K. Kasturirangan, who was the Chairman at that time. Dr. Rangan, as he is affectionately called, has been showing a keen interest in this hobby and is encouraging amateur satellite activities in the country. After his retirement from ISRO he has been nominated as a Member of Parliament.

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by John M. Franke, WA4WDI
- * ARISS 2004 Status Report
by Frank Bauer, KA3HDO, et.al.

To Order: *Proceedings - 2004* Minimum donation:

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AMSAT-NA

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HAMSAT Information: VO-52 HAMSAT
Catalog Number: 28650
Launch Date: May 05,2005
Status: On orbit
Current Mode: U/V
Proposed frequencies:

Indian transponder:

Uplink : 435.225MHz to 435.275MHz LSB/CW
Downlink: 145.875MHz to 145.925MHz USB/CW
Beacom : 145.940MHz continue carrier signal

Dutch transponder:

Uplink : 435.225MHz to 435.275MHz LSB/CW
Downlink: 145.875MHz to 145.925MHz USB/CW
Beacon : 145.860MHz 12WPM with CW message

HAMSAT has been assigned the OSCAR designation VO-52.



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